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There's no agenda yet for Air Coordinating Committee's forthcoming policy review requested by President Eisenhower. Government agencies had October 20 deadline to submit items they wanted considered. List of topics may be in final form next week.

ACC, incidentally, has had its fiscal 1955 budget cut 10% from this year's $129,000. Personnel cutting won't start until after policy review is complete.

•

Insiders say that CAA's forthcoming recommendations on airways user chargers will include:

System of charges should become effective in mid-1954.

Gas tax should be considered a user charge. However, if this isn't acceptable to other government departments, a gross ton-mile charge should be made on planes over 4500 pounds gross. Planes under 4500 pounds would pay annual fees ranging from $10 to $50.

Control tower operational costs is one item Commerce intends to incorporate in user charge determinations. Much talked of move to turn airport control tower operations over to local municipalities is out the window, according to Undersecretary of Commerce Robert B. Murray, Jr. Federal operation of control towers will continue. Fiscal 1955 budget carries control tower funds.

•

Railroads have opened fire on the Curtiss C-46 and in particular on the non-scheduled airlines using this equipment on CAM (Civil Air Movements) operations carrying troops.

Stakes are big. Military services spent almost $30 million for air travel in first six months of 1953. This is up 250% over two years ago.

Railroad officials have openly sought cooperation of Air Transport Association in their attempt to undermine carriage of military personnel by non-scheduled lines.

ATA declined. Railroad program has resulted in numerous "fact" and fiction stories in public press, radio blasts on "news programs," etc.

Railroads have cut rates by as much as 45% in past month to force military to use rail travel for personnel rather than CAMs. A freak arrangement in old laws makes it possible for railroads to sell transportation to the government below tariffs, or for that matter even give it away. Airlines can't legally meet the rates.

•

Despite official denials by both companies, Continental Air Lines and Pioneer Air Lines have made considerable progress toward a merger.

•

There's no indication that Ralph S. Damon will leave the TWA presidency when his five-year contract with Howard Hughes expires next January 31. It's unlikely that Damon will ask for a new contract (he doesn't think it's necessary) or that one will be offered.

Damon has established one of the industry's all-time outstanding records with TWA.

The Washington View

The High Cost of Building

The Air Force is eagerly awaiting the results from the first of five special studies which were initiated last month at an equal number of aircraft and engine firms. Purpose of the studies, which are being made by professional management consultants under AF contract, is to seek ways of improving the overall Air Force contracting procedure. If it is successful, it is believed the Air Force will want the entire industry similarly surveyed.

Five firms currently under analysis are: Consolidated Vultee, Republic, Northrop, C-W's Wright Aeronautical Division, and GM's Allison Division. Although no reason was given for the selection of the particular firms for analysis, the implication is the Air Force is after information on a broad industry basis. They were chosen, undoubtedly, because they present typical situations and problems from which generalizations may be made to improve Air Force procurement practices.

Air Force officials said the consulting specialists were called in because of a mounting concern over the high cost of aircraft, engines, and related equipment. In order to help pinpoint any important causes of high cost, the "selected" companies agreed to open their doors for a series of brief diagnostic surveys. They involve a review of operations of the companies and their contractual relations with the government. The ultimate aim, reportedly, is to determine possible ways of making better use of incentive type contracts to reduce overall contract costs.

The Military as Deterrent

The Eisenhower administration, from all indications in Washington today, is about ready to shift away from the balanced force concept. The basis for such a change is found in the effort to reconcile the nation's defense needs with the ability to pay. It may well be the decision has already been reached. Deputy Defense Secretary Roger Kyes appears to give every indication it is the new trend.

Last week, Kyes called for "discarding the outmoded procedures and weapons which will no longer serve more than tradition." He further declared that "there is a need for a reassessment of strategic planning and logistics in the light of technological advances." Pentagon observers have widely interpreted Kyes' statement as advocating an end to the balanced forces concept—at least to the extent that it means slicing up the defense dollar in conformance to tradition rather than to realities.

Support for this position has come readily and from widely separated sources. For one, Convair's president Gen. Joseph T. McNarney told a Fort Worth audience that the development of modern absolute weapons means the military force is becoming primarily a war-deterrent and only secondarily a battle force. Adjustment to this fact, he said, calls for some changes which include the necessity of breaking away from the balanced force concept. Said McNarney, "we can't have a division of defense dollars on a 'one for you and one for me' basis among the Army, Navy and AF."

Sen. John F. Kennedy (D., Mass.) charged at an Indianapolis American Legion meeting that the $5 billion cut in Air Force funds was an ill-timed return to the balance force concept, which he added, "does not take into account the decisive nature of atomic and hydrogen weapons." The defense effort must be more in keeping with the perils of the time, he said. "The U.S. has no alternative than to give priority to the development of a strategic air force with sufficient retaliatory powers to threaten a potential aggressor with havoc and ruin."

Balchen: Out of the Basement

Air Force Col. Bernt Balchen, Arctic expert, retired this week after 30 years of valuable service. No effort was made to forestall the loss of his services. Balchen was forced to retire—he had been passed over by the AF promotion board and had five years in grade.

Not so long ago he was up to his neck in the work he loved. His last big job was a survey in northern Greenland which preceded the construction of Thule AFB, only 910 miles from the North Pole. But most recently the polar region expert had been relegated to a basement office in the Pentagon. He was advising another colonel on Arctic operations.

Balchen has long felt that the Arctic is one of the most important frontiers which should be protected. He has deplored the AF's failure to have people especially trained for this service. It is the wrong approach, Balchen comments, for the Air Force to have top officers shuffling back and forth from the Polar regions "every two years." Unfortunately Balchen's advice has not been sought by Air Secretary Harold Talbott, although he was very close to former AF Secretary Thomas K. Finletter.

As a result of his mandatory retirement, Balchen is strongly thinking about working for a commercial airline in Alaska. There is a very big mission in the development of the Arctic for future airline use on a more extensive scale, he believes.

It apparently would take an act of Congress, now, for him to become a brigadier general. But that is in the realm of possibility. An officer before he was naturalized in 1931, Balchen received his commission by a special act of Congress.

. . . Preble Staver

This one was built to *BOOMERANG on purpose!*

Official U. S. Navy photograph of the pilotless Regulus, landing after test flight

IN developing the pilotless Regulus, the Navy's new guided missile, Chance Vought called upon the Aviation Products Division of Goodyear for help in solving two tough problems.

First, it was imperative that the experimental missiles be made *returnable*—be made to come back to base and land after launching—in order that data essential for perfecting the production model could be obtained, and economy maintained.

Goodyear delivered specially designed wheels and brakes for the retractable main gear required to land the ultra-high-speed Regulus. As pioneer of the famed Single Disc Brake which has unequaled capacity for its size and weight, Goodyear was the logical choice for the job.

Next, a new-designed fuel cell of rubberized fabric was needed—one which could be actuated by an air-pressure diaphragm rather than the conventional fuel pump. Again, Goodyear delivered the goods.

The above are typical of countless aeronautical problems aided in the solving by Goodyear experience—which has been contributing to aviation progress since 1909. Goodyear, Aviation Products Division, Akron 16, Ohio or Los Angeles 54, California.

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Letters

Letters should be addressed to The Editor, American Aviation Magazine, 1025 Vermont Ave., N.W., Washington 5, D. C. Anonymous letters will not be printed, but names will be withheld upon request.

AFA EDITORIAL

To the Editor:

MANY THANKS FOR THE WONDERFUL EDITORIAL. HOPE WE CAN CONTINUE TO JUSTIFY YOUR CONFIDENCE AND SUPPORT.

ARTHUR F. KELLY
Chairman of the Board
Air Force Association

•

To The Editor:

I thought your editorial on AFA's "Fresh Look" contained in the Sept. 14 issue of AMERICAN AVIATION was splendid.

So many people look upon the Air Force Association as being entirely biased and as but a stooge for the Air Force. I can assure you that this is not true, and was not true during my tenure of office as president or chairman of the board. We do believe in air power and in what it can do for our country.

HAROLD C. STUART
1001 Connecticut Avenue N.W.
Washington 6, D.C.

•

COMPREHENSIVE

To the Editor:

Please accept my apologies for this belated note but I have been travelling almost continuously in the last month and have only just been able to take this opportunity of thanking you for the BWIA article. I think it is amazingly comprehensive and does admirable justice to a fairly complex subject.

Again many thanks.

C. F. SPURRIER
Assistant to General Manager
British West Indian Airways Limited
Port-of-Spain
Trinidad, B.W.I.

•

AIR SAFETY

To the Editor:

I got back from spending 2½ days in the CAB's public hearing into the mid-air collision over Michigan City, Ind., to find your September 28 issue, and the letter by W. W. Andrews on page nine.

Mr. Andrews apparently has fallen for that old gimmick to the effect that the way to prevent violations of the present Civil Air Regulations is to invent some new regulations which would somehow make it more illegal to violate regulations than it already is.

For 2½ days I listened to a baffling variety of technical, complex discussion. We had to sit through the power settings for a Convair 340 (United's), American's 240, the life histories of the respective airline companies involved, the pilot's histories, and a vast amount of other trivia—all presumably aimed at determining what caused those two airplanes to collide at about 11,000 feet over Michigan City in CAVU conditions.

Out of all this mass of stuff finally seeped the obvious facts: nothing whatever was wrong with the airplanes, the engines, the radios, the physical condition of the crews, the financial condition of the companies, or the bookkeeping systems they used. Just one thing was clearly wrong: the four pilots simply weren't looking where they were going.

I suppose it's normal for all of us in aviation to subconsciously make everything pertaining to flying appear complex and explainable only by a few selected experts. Not so in this case; it all added up to the same thing, and it would be no different if it had been one bus running into another bus on the highway. All the hardware was found to be in first-class shape; the drivers just weren't looking where they were going.

Mr. Andrews could write new rules until he was paralyzed. If the pilots for some reason don't look where they're going in the most perfect weather, there's no rule known to man that will make up for such carelessness. The present rules for VFR flying are quite adequate—if they are used. Unfortunately, they have been badly misused for so long that the average person's reaction is pretty much like that of Mr. Andrews. They apparently think it's quite normal and logical for airplane pilots to go charging blindly through space, running into other airplanes, and that some non-existent law is needed to impress upon them that that's not the safe way to fly.

Of course, that's so much bunk. We've had air traffic rules for years which say quite clearly and simply that careless and reckless flying is not to be tolerated. There are appropriate means for prosecuting violators, and the penalties can be severe.

Mr. Andrews is somewhat vulnerable for selecting the Michigan City collision as his proof that new regula-

tions are needed. I was startled to listen to passengers in those two airplanes testify that they saw the other some time (one as much as five minutes) before the actual collision. This would hardly indicate that the United and American pilots were "overflying their eyesight," as Mr. Andrews put it.

MAX KARANT

Assistant General Manager
Aircraft Owners and Pilots Association
P. O. Box 5960
Washington 14, D. C.

•

LOUDSPEAKERS AT NEWARK

To the Editor:

The editorial page of your August 17 issue contained a well earned plaudit for the N. Y. Port Authority for the excellent terminal facilities recently commissioned at Newark Airport. Mention was made of "an excellent centrally located loudspeaker system which . . . is operated by Allied Maintenance." This statement, while quite true, might be somewhat misleading. The two very competent and attractive operators of the paging system are employed by Allied Maintenance; however, the loudspeaker system is owned, installed and maintained by the New Jersey Bell Telephone Company.

Our company worked in co-operation with the Port Authority to create an outstanding communications installation at Newark . . .

The telephone companies across the country are vitally interested in the progress that has been made by aviation in these first 50 years and are playing an increasing role in furthering this success story.

L. S. KING

General Service Manager
New Jersey Bell Telephone Company
540 Broad Street
Newark 1, N. J.

•

SPAIN COMES BACK

To the Editor:

I wish to thank you for your kindness in sending me an extra copy of the Sept. 14 issue of AMERICAN AVIATION with the article entitled "Spanish Industry Stages Come-Back."

I have read this article and have found it of great interest, and do believe that Spain will also find it so.

LT. COL. JULIO SALVADOR

Air Attache
Spanish Embassy
Washington, D. C.

•

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Editorial

Letter to a Secretary

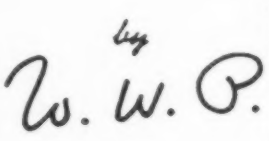
Honorable John Foster Dulles
Secretary of State
Washington, D.C.

Dear Mr. Secretary:

THE AMERICAN AIRCRAFT manufacturers and the American flagship airlines are quite genuinely concerned about the attitude and the policies of your Department.

Let's admit at the outset that you have one of the toughest jobs in the world today. No one could or would deny this.

Let's admit, also, that compared to the obviously vital and pressing problems of Korea, the Far East, the U.S.S.R., Trieste, Iran, Germany, and others in the world complex, the problems of aviation may seem, to you, relatively insignificant.



We think an incontrovertible case exists, however, for the vital importance of this country's aviation in today's and tomorrow's world. Perhaps one bit of evidence in favor of this is that eight to a dozen years ago, aviation *did* occupy a position of importance in the Department which you now head.

Today aviation is a tiny sideline quite far removed from your own good counsel. But believe us, Mr. Secretary, *aviation is not a sideline in other governments of the world.* National self-interest is not being neglected elsewhere.

The concern of our manufacturers is with the *attitude* of your people—our servants—abroad. This is not a new problem. It has existed for many years back. But it's time that something was done about it.

There are some noteworthy exceptions, of course, but the average American embassy and legation abroad has an ingrained abhorrence of anything smacking of commercialism. Yet the sale of American aircraft abroad is of extreme importance in many more ways than merely making commercial sales. No manufacturer asks any American foreign officer to engage in selling, but there are a great many times when our foreign service could be very helpful in aiding an American sale versus a competitive sale from another country. Yet the attitude of your people—our servants—ranges from indifference to scorn and even, on occasions, downright passive sabotage. There is no lack of specific examples available.

You must be aware, or you should be aware, that the diplomatic services of some other leading countries are active agents sparking the sale of commercial products and especially such important products as commercial airplanes. Royalty even takes a hand in pushing the home products. And just recently, a big foreign banking group—with the active aid of the particular government involved—was getting ready to offer easy credit terms on a scale difficult to match by the U.S., especially since we *give* most of our money away without really putting it to work in international trade. Is it too much to ask that our foreign officers soil their delicate hands ever so slightly in the furtherance of this country's world interests?

There is *so much* that your Department *could* do, even if it only means a change of attitude from sneering and brushoffs to one of manly manners (and perhaps of understanding where the money comes from to pay the salaries).

Now on the airline front, Mr. Secretary, just where *do* we stand? Back in 1944 this country called the first postwar international air conference and spearheaded a drive for freedom of the air. Quite apart from the fact that we were sold a "five freedoms" bill of goods which proved to be disadvantageous to anyone who really sought freedom of the air, the fact remains that what little we salvaged from the 1944 conference seems to have deteriorated ever since.

There is even reason now to suspect that we may be heading toward a restrictive policy. Does anybody *really* know what our policy is? We mean apart from high-sounding words. Are you aware of the present aviation problems in India, Brazil, Mexico, the Middle East and other touchy spots? Do we *really* believe in the 1944 freedom policy? Do you know what will happen to our air rights when we stop buying those rights with billion-dollar gifts?

The case is very strong that international aviation is a great weapon for peace. It is a means of reducing the petty suspicions and attentions to national boundaries. It can help in a multitude of ways to foster international relations. Yet aviation keeps sliding farther and farther down the scale of things in your Department. Certainly you have some pleasant chaps working hard at the job of checking the decline of our air influence abroad, but this isn't enough. Not by any means. Aviation needs to be pushed high up the Department ladder. That is, unless you want to assist it into the oblivion which received so completely our merchant marine.

Your urgent personal attention is needed, Mr. Secretary, before our manufacturers and our airlines are neatly maneuvered out of the firm positions warranted and merited by this country's economic and political standing in the world.

Respectfully yours,
WAYNE W. PARRISH

"A Statesmanlike Doctrine for Airpower" . . . .

• that's this Air Force Association's "Statement of Policy," according to an Editorial in American Aviation

EDITORIAL

AFA's 'Fresh Look' Appeal

ALL OF those aviation organizations which turn out reams of resolutions once a year and all of those strictly partisan organizations, such as the Navy League, should take this occasion to examine the statement of policy approved by the seventh annual convention of the Air Force Association in Washington late last month.

W. W. P.

Here is a statesmanlike doctrine for air power which stands high above the petty service rivalries which temper so many similar policies. Here is a working program for the good of the services and the nation which speaks not only with unaccustomed clarity about air power requirements in the H-Bomb era but offers concrete proposals by which air power can be implemented.

The Air Force Association has emerged since World War II as a new and potent influence on behalf of air. Under the leadership of its retiring president, Arthur F. Kelly, vice president of sales for Western Air Lines, its convention in Washington included a one-day air power symposium of unprecedented vigor and statute. AFA can be proud of its youthful record.

What is AFA asking for? It wants more than the "fresh look" at our military effectiveness now being undertaken by the Joint Chiefs of Staff. It wants a "fresh look" at our weapons evaluation system by experts independent of the individual services. It wants a . . . power commission . . . completely free of . . . pass on the findings of . . . nation with a new . . . tion of our entire . . .

Thus it is sound . . .

Take weapons eva . . . JCS need professional . . . —help which ordinarily . . . Weapons Systems Evalua . . . Unfortunately, this segm . . . Defense has not been . . .

provide an objective evaluation not only of weapons but of our military effectiveness. Such a group should have access to the findings of the JCS and to scientific testimony. It should be non-partisan and its directive should be broad in scope.

But a new commission is only a start. AFA believes. It recommends the establishment of a permanent organization devoted to the formulation and review of national strategy, and a continuing evaluation of our military effectiveness. It should be studied by a group of eminent citizens "and completely free of military influence or control. It should be financially and politically independent of pressure by any branch of government. It should be financially strong enough to attract and retain the best non-partisan thinkers in the nation."

We have given the AFA statement of policy attention on this page because we believe this organization, almost alone is striking at fundamentals in our military program. Not only do we need a "fresh look" at our entire military enterprise, but we should stop expecting military leaders to serve as economists and stop expecting our civilians to serve as strategists. We don't permit anyone to be defendant, counsel, jury and judge all at the same time. But we have been expecting (or permitting) uninformed officers to be strategists, economists, industrialists and financiers all at the same time. Dr. . . . military program for the nation . . . that way. We like AFA's broad . . . advocate its adoption.

. . . page was privileged to be . . . invited guests from the U. S. . . . the big new Kitten U. S.

Editorial in American Aviation by Editor & Publisher WAYNE PARRISH Sept. 14, 1953

"All of those aviation organizations which turn out reams of resolutions once a year and all of those strictly partisan organizations, such as the Navy League, should take this occasion to examine the statement of policy approved by the seventh annual convention of the Air Force Association late last month. Here is a *statesmanlike doctrine for airpower* which stands high above the petty service rivalries which temper so many similar policies."

"The Air Force Association has emerged since World War II as a new and potent influence on behalf of air . . . AFA can be proud of its youthful record."

"We have given the AFA statement of policy attention on this page because we believe this organization, almost alone, is striking at fundamentals in our military program. . . . We like AFA's broad policy approach and advocate its adoption."

WHAT IS THE AIR FORCE ASSOCIATION?

It's an independent, non-military, non-partisan organization, established in 1946. It was founded by such former Air Force men as Generals Spaatz, Doolittle and others to work for adequate airpower in the interest of world peace. It publishes "AIR FORCE" Magazine, a monthly publication which is recognized as the authoritative journal of military aviation. It works for airpower on a local basis through AFA Squadrons all over the country. It co-sponsors the annual Wright Brothers' Celebration at Kitty Hawk. It stages a national airpower convention each year where leaders of government, labor and industry meet to discuss in open forum their common plans and purposes.

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2. Honorably Discharged Members of USAF or Predecessor Services—Active Membership ..... $5 Annually
3. AF ROTC Cadets or CAP Cadets—Cadet Membership $3 Annually
4. Civilians Who Wish to Demonstrate Their Interest in Aviation—Associate Membership ..... $5 Annually

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- Please tell me how I can become an AFA Member on a .....basis. ☐
  (SERVICE, ACTIVE, ETC.)
- Send details on how my company can affiliate with AFA as an Industrial Associate. ☐

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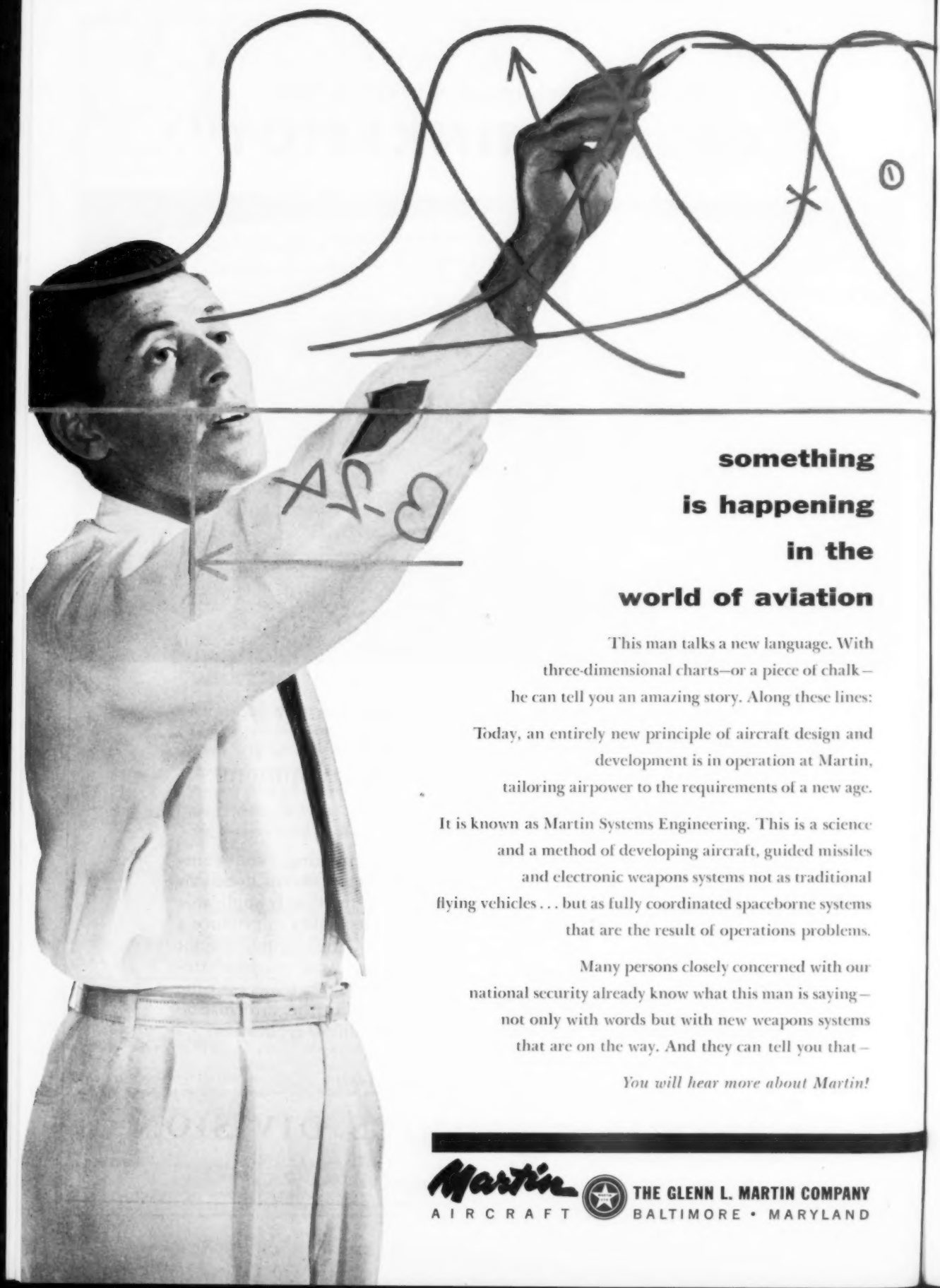
AIR FORCE ASSOCIATION'S "Statement of Policy"

ASK ABOUT OUR PLAN FOR AFFILIATION OF YOUR COMPANY WITH "AFA" AS AN INDUSTRIAL ASSOCIATE



something is happening in the world of aviation

This man talks a new language. With three-dimensional charts—or a piece of chalk—he can tell you an amazing story. Along these lines:

Today, an entirely new principle of aircraft design and development is in operation at Martin, tailoring airpower to the requirements of a new age.

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THE GLENN L. MARTIN COMPANY
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Industry Spotlight

The B-47D, according to industry reports, will be a combination turboprop/turbojet-powered aircraft. A Curtiss-Wright T49 turboprop engine will be installed in place of each inboard, double jet pod. The single outboard jet pods remain untouched.

•

Rolls-Royce is at work on a new turboprop type engine which should be announced in the near future. It is a 3000 horsepower turbine which the company expects to advance to 4000 horsepower within a period of four years.

•

A basic difference in U. S. turbine engine design practice is now becoming apparent. Several manufacturers, looking back on the approximate 50% growth in engine power during the life of older models, are designing engines with frontal areas to support similar growth. At least one manufacturer feels such radical growth is tapering off; this firm is putting its effort toward designing the best possible compact engine it can design. It will depend on future models to take care of growth factors.

•

Industry speculation is that Lockheed Aircraft Corp. may be leading the atomic-powered-aircraft design race. The U. S. Air Force held up any mention of the Lockheed contract, which Lockheed officials claims was the first one let, for 28 months prior to releasing a simple acknowledgment earlier this month.

•

There is no basis for industry rumors that the Douglas Aircraft Company is planning an advanced model of the Douglas DC-7 to be known as the DC-7B and featuring Fowler type flaps. Douglas is working on a new flap linkage which would be applicable to both the DC-6B and DC-7. This is still in the wind tunnel but shows considerable promise.

•

Fairchild Airplane & Engine Corp., which will show the airlines a commercial version of its delta-wing cargo plane proposal late this month, has been seeking a technical information exchange agreement with A. V. Roe Ltd., manufacturers of the AVRO Vulcan. AVRO officials declined the exchange offer because they feel they lead the world in experience on large aircraft of this type and plan on building their own commercial jet transport, the AVRO Atlantic.

•

Data released at the time of the Douglas F4D's successful attack on the world speed record, which it set at 753.4 miles per hour, disclosed the Navy fighter has a wing span of 33 feet 6 inches and length of 50 feet. Powered by a Westinghouse J40 jet engine, rated at 11,600 pounds with afterburner, the plane weighed 20,000 pounds at take-off, 16,550 on landing. Some 3440 pounds of the plane's 700 gallon fuel supply was used up.

•

AVRO Orenda engines and Armstrong Siddeley Sapphire engines, both rated at around 8000 pounds thrust, are being proposed as substitutes for the 3500-pound Rolls-Royce Derwents in the AVRO Jetliner. The airlines, three of whom are reported interested in reviving the Jetliner if the range can be increased to 1500 miles, want the Sapphires, while AVRO favors the Orendas.

B.F.Goodrich

The weight B.F.Goodrich saved here...is still on this plane

NO MATTER what job the Navy thinks up for Lockheed's Neptune, it always turns out that a lot of equipment has to be taken along. Maybe it's electronic search equipment, and/or a lot of added armament, but whatever it is, it's important. The airplane has been designed through many changes, always stepping up her capacity to carry more useful load.

Some of this weight-saving comes out of landing equipment. From the beginning, this famous series has been equipped with B. F. Goodrich wheels, brakes, tires. One of the weight-saving changes on the BFG brakes is a new kind of brake block. No rivets are used. The lining is cemented onto a light magnesium shoe. And the brakes last longer because more of the lining is used.

Another way the brake was made lighter (and better): The B. F. Goodrich expander tube principle has the basic advantage that braking action applies equal pressure over the full circle of the drum, giving greater braking power, better load distribution. Today's B. F. Goodrich brake has a new, narrow-cavity tube that gives even *more* braking pressure, with *less* fluid, and, of course, *lighter* weight.

Landings on the new brakes are safer, smoother. The brakes respond smoothly and quickly to minimum pressure, take emergency overloads better, cannot lock or grab. There are other advantages. Ventilated shoe dissipates heat more rapidly. Retractor spring action eliminates wear due to drag. Relining can be handled with a screwdriver and wrench.

The B. F. Goodrich wheels on the Neptune are light, strong magnesium castings. Tires are the lightest weight practicable for the loads carried. These developments for greater safety *and* less weight are typical of continuing product improvement at B. F. Goodrich.

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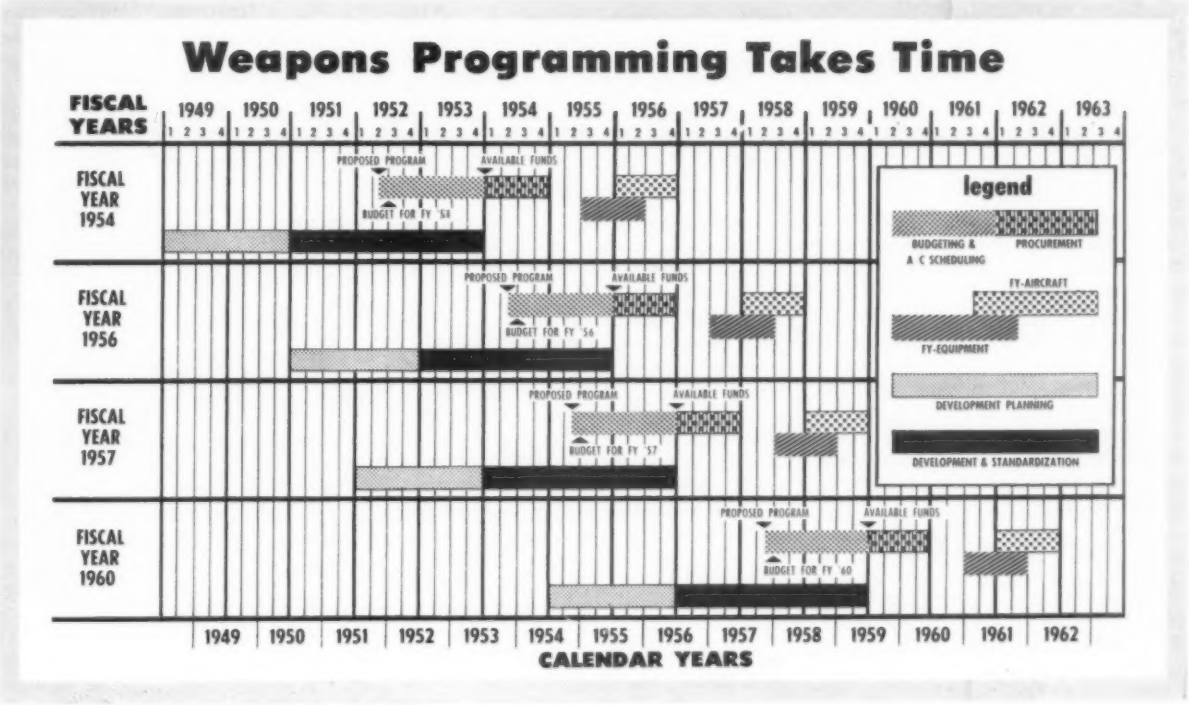


Lead Times: Challenge for Weapons Systems

Future of USAF's new program hinges on coordination with accessory equipment firms.

By Philip A. Fitzsimons

ONE of the greatest upsets and reorganizations ever to hit the aircraft and engine equipment manufacturers is foreshadowed by the Single Prime Contractor Policy under the much discussed Weapons Systems Concept. The obstacles ahead for the SPCP are impressive and, according to top industry officials, the need for satisfactory solutions to many of the known problems may well delay for several years any widespread application of these new policies.

The $64 question is this: "Will the SPCP eliminate program slippages, cut lead times, save money or produce better combat-ready aircraft?" The answer lies in a better understanding of the problems which have prompted the Air Force to experiment:

• **A firm equipment** development plan is needed, one stretching over a period of years, to avoid continued reprogramming. Such reprogramming aggravates the problem of proper equipment development and standardization and in turn prompts large scale retrofitting.

• **The split in authority** and responsibility which finds Wright Air Development Command (WADC) engineering interests and Air Materiel Command (AMC) production interests contradicting each other.

A number of specific difficulties have arisen in these major problem areas:

• **How to avoid "sole-source"** procurement practices by building adequate productive capacity for equipment in development.

• **How to cope with airframe manufacturers'** model specifications which must be extensively changed, due to inadequate guidance on what accessory equipment is available for production aircraft.

• **How to get along without a**

stated policy for determining whether equipment will be government furnished (GFAE) or contractor furnished (CFE), and without adequate agreement on status of equipment items for production aircraft. This often prevents proper production and procurement timing necessary to phase equipment into aircraft as scheduled.

Possible solutions include:

- **Long range development,** production and procurement planning, preferably for 3 to 7 years;
- **Decision-making authority** delegated to the operating levels in order to resolve conflicting engineering (WADC) and production (AMC) interests. Lacking this, it is suggested that developmental functions of WADC be re-integrated into AMC, or an office under the Joint Chiefs of Staff should handle both functions;
- **Productive capacity** for newly developed products assured by providing the equipment manufacturers with sufficient time to make detailed specifications available to the USAF and industry, thus permitting competitive bidding or production.
- **A workable yardstick** created to guide aircraft manufacturers when formulating new aircraft specifications. This will require WADC and AMC agreement on the developmental status of equipment.

Critics uniformly agree that equipment phasing problems can be overcome if both Congress and the Air Force understand the need for a firm planning base. Periodic top-level Air Force reprogramming prevents proper phasing of equipment into aircraft.

Five-Year Base

The programming cycle chart on page 17 establishes a planning base of five year development period overlapping the four and one half year production planning cycle by one and one half years. It is based on the best estimates of the time required by Air Research and Development Command's WADC and the Air Proving Ground Command to fully develop a piece of new equipment to "standard" status.

The program planning for new aircraft to be delivered in fiscal year 1956, as shown on the chart, should have been performed in the period of late 1951—early 1952. However with a planning base of five years the development planning of equipment such as fire control and bombing systems *should have been started* for these aircraft *in fiscal year 1947.*

The Air Force should now be starting development of equipment items essential to the performance characteristics of aircraft scheduled for delivery during fiscal year 1960.

Production and procurement of a developmental item in a short time is a very expensive proposition, if and when it can be accomplished. When it can't be accomplished less effective items must be used or slippages must occur in phasing the item into the aircraft and later retrofitting this item.

A factor greatly influencing the ability to meet program schedules is the insistence on competitive buying dictated by Air Force procurement directives. The "sole-source" procurement procedure might meet scheduled demands by purchasing from the equipment manufacturer who has been developing the item during the evaluation and development period of the aircraft. However this practice has been frowned upon officially as an undesirable procurement method.

Inevitable Pitfalls

Even the slow production period of approximately one and a half years currently being tested by the Air Force, the Cook-Craigie plan, has inevitable pitfalls for phasing the required equipment into the aircraft when the evaluation period is over and volume production starts.

AMC production and procurement people have said they should know about six months after the intensive service evaluation period starts what specific accessories and equipment are going to be needed. Wright Air Development Command engineering spokesmen respond that they can't possibly know that early.

At present the determination of what is to be Government Furnished or Contractor Furnished equipment is based on the relative complexity of that equipment. Yet the Air Force has no stated policy for this determination.

In order to come up with a complete combat-ready aircraft, planning must be made for all equipment items in sufficient time to develop a production and procurement program properly phased to match the aircraft assembly line needs. This is only possible when GFAE and CFE are defined sufficiently in advance, including the classification of all items according to their stage of development.

One of the most critical elements in establishing production schedules has been the inclusion in model specifications of developmental items.

When the Wright Air Development Command (WADC) of the Air Research and Development Command (ARDC) reviews a model specification it may and often does substitute equipment of development status for the equipment proposed by the aircraft manufacturer. This often appears necessary, in view of evaluation tests, to bring the performance of the aircraft up to the defined program needs. The procurement of these particular developmental items, however, often cannot be accomplished in time.

A prominent member of the equipment industry suggests that the status of both GFAE and CFE should be agreed to by the engineering interests in WADC and the production interests in AMC. The agreed status of all equipment should be made available as a guide to the aircraft manufacturer.

Critics have believed for some time that the fundamental cause of these problems lies in the lack of integration at the operating level or by a top level management team.

One new development in this direction came as Secretary of the Air Force Harold Talbott delegated responsibility for all production and procurement functions in the Air Force to Lt. Gen. Orval Cook, Deputy Chief of Staff/Materiel. Gen. Cook now has Air Force purview over both AMC and ARDC.

While Lt. Gen. Laurence Craigie, Deputy Chief of Staff/Development, retains his responsibility for research, he now reports to Gen Cook.

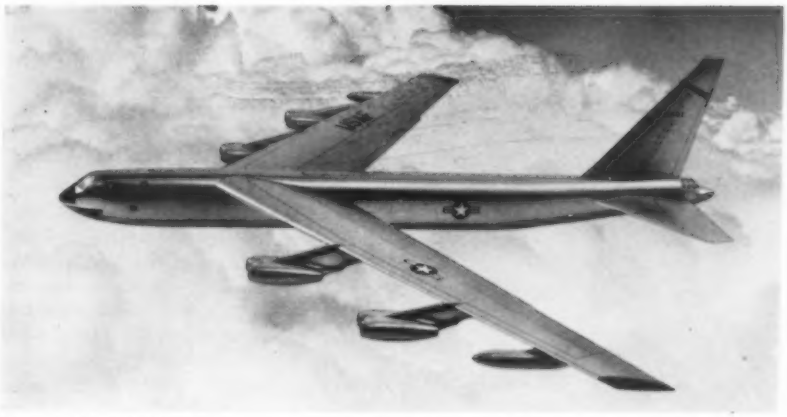
Past Performance No Guide

It is presumptious, many claim, to judge the expected performance ability of aircraft manufacturers designated Single Prime Contractors on the basis of their past CFE performance. To illustrate this point, CFE aircraft development time has been taking two to four years. When obliged to develop and buy the fire control system presently supplied as GFAE, the Single Prime Contractor will be faced with managing a 7-10 year development period.

The Single Prime Contractor Policy under the Weapons Systems Concept presumes a gradual decline of the GFAE program and a concurrent increase of the CFE program. This condition, however, does not appear to alter the problems inherent in getting the right kind of equipment, at the right time, into the proper aircraft. The problems facing the Air Material Command, observers say, will simply move to the Single Prime Contractor.

The key to SPCP success is the unknown factor of the aircraft manufacturers' performance ability. The equipment industry is keeping close tabs on Convair's B-58 project, the first to operate under SPCP, for clues. Convair is currently sparking an equipment development program before starting production of the B-58 airframe.

Only SPCP experience will show whether or not the aircraft manufacturer with a free reign is in a better developmental position than the Air Force. • • •



New Stratofortress. Model of the Boeing B-52A shows new nose and crew compartment design, allowing for side-by-side seating of the pilot and co-pilot. Auxiliary fuel tanks are slung beneath the wing near the tip. The B-52's, now slated for second-source production at Boeing's Wichita plant, will make up "more than seven" bomber wings.

Fairchild Wins Chase C-123 Contract

Fairchild Airplane & Engine Co., Hagerstown, Md., is gearing itself for production of the Chase-designed C-123B assault transport after its recent victory over four other aircraft manufacturers in the bidding for the "Avitruc" contract.

Production of the controversial plane should get under way about the middle of next year, according to W. L. Landers, vice president and general manager of Fairchild's Aircraft Division. Present Air Force planning calls for about 165 C-123B's for Army use.

Landers does not anticipate the hiring of additional personnel for the new contract. Due to the present stretchout in C-119 production, enough workers will be available for building the assault transport, he said. Deceleration of the C-119 schedule has already caused the laying off of some 600 persons, while another 600 are expected to go by the middle of November.

In awarding the contract to Fairchild, AF Secretary Harold E. Talbott said the bid was accepted "because it was on a fixed price, non-redeterminable basis and was 10% lo... than the next lowest bid." He further stated that the contract will call for Fairchild's use of tooling and materials procured by Kaiser and now in storage.

Kaiser had originally held a contract to produce the planes. Under contract terms only a downward revision in Fairchild's price will be possible as a result of the firm's use of these items, Talbott added.

Unsuccessful contenders in the bidding, all of whom were invited to submit bids by the AF, include Consolidated Vultee Aircraft Corp., The Glenn L. Martin Co., Lockheed Aircraft Corp., and North American Aviation, Inc. Fairchild did not receive an invitation but asked and was permitted to bid at the last moment.

Following announcement of the contract award, Fairchild officials immediately planned trips to Willow Run, Mich., to inspect the Willys Motors (Kaiser) tooling for the "Avitruc." They also set up talks with Michael Stroukoff, president of Stroukoff Aviation Corp. and designer of the C-123B, in regards to possible awarding of subcontracts to the West Trenton, N. J., company.

CHASE-BUILT version of the C-123 in flight.

TWA Begins Non-Stop NY-Los Angeles Flight

Trans World Airlines inaugurated an eight-hour eastbound transcontinental non-stop service between Los Angeles and New York with one flight daily beginning October 19. The flight is scheduled to depart Los Angeles nightly using Lockheed Super Constellations with a sleeper-sit up combination, in competition with the announced American Airlines' Douglas DC-7 non-stop service scheduled to start November 29.

National Air Policy Review Mostly Civil

The primary emphasis of the forthcoming review of the nation's aviation policy by the Air Coordinating Committee will be upon civil aviation, including the many important areas of inter-relationship between civil and military aviation, according to Under Secretary of Commerce for Transportation Robert B. Murray, Jr.

During a recent speech, Murray said that the review will not cover aviation issues of a strictly military nature, since such questions are receiving attention at other government levels.

When ACC has decided on a specific agenda of individual policy issues to be reviewed, Murray explained, each member agency will then develop its comments and proposals on those affecting its area of responsibility. Time and personnel limitations will preclude holding formal public hearings, he said, but industry groups will be invited to submit pertinent information and recommendations "in the form of written statements."

Of current ..iation studies on airline development policies, the role of the Government in airport development, and airways user charges, Murray said that they are proceeding and that major portions would be completed by late this year.

Ryan Aeronautical has entered its Model 72, military version of the Navion, into the Naval Air Training Command competition for a trainer to replace the North American SNJ. Modifications on the Navion include new wing tip design which increases span four feet and installation of "all around" visibility in canopy. Full plexiglas bubble canopy will be standard in production model. Side-by-side trainer can utilize either the Continental O-470-A, O-470-13, or Lycoming GO-435, C2B engine. Gross weight increases to under 3000 pounds, compared to 2850 pounds in commercial version. Dimensions: span, 37'8", length 27'9".

Examiner in Favor of Slick-Tiger Merger

CAB Examiner F. Merritt Ruhlen has recommended CAB approval of the merger of Slick Airways into The Flying Tiger Line. Ruhlen said the unified company will be able to operate more economically than either company can separately.

He added that the merged firm "will have a much greater chance to continue as an effective competitive air cargo carrier than would either carrier operating separately."

The merger agreement, entered into in the spring, contemplates that FTL will be the surviving company. It is subject to final CAB approval, a decision looked for by the parties before the end of the year.

Ruhlen recommended approval subject to compliance by the merged firm with various labor protective conditions.

New Members Attend Ninth IATA Meeting

The Ninth Annual General Meeting of the International Air Transport Association in Montreal October 5-9 was attended by two new member airlines—Hunting Air Transport and Japan Air Lines. At the end of the meeting it was learned that Air-Vietnam has joined IATA and that three others—Aigle Azur, Airwork, and Alitalia—are in the process of doing so.

The tenth AGM will take place in Paris starting September 13, where Max Hymans, board chairman of Air France, will take over the IATA presidency from G. R. McGregor, president of TCA.

The Montreal meeting showed that there is increasing concern that tourist and first-class services are becoming too similar and that reduced revenues are bringing airlines "close to the economic margin."

Douglas: No Jet Yet; DC-7 for Time Being

Douglas Aircraft Co. president Donald W. Douglas reports that most satisfactory progress is being made in the development of a practical and dependable Douglas jet transport, but that his firm expects to maintain its prestige in the commercial field for the immediate future with the DC-7.

Douglas pointed out that the first company to build a prototype is not necessarily the one which gets production orders, adding, "We cannot overlook the fact that in a few weeks fleets of highly improved DC-7's will provide the airlines with proven and profitable services on a par with the more expensive and more or less experimental untested performances of jets-to-be promised elsewhere for the next few years."

"We do not plan to begin construction on these newer turbojet types until we have satisfactory answers or considerably more progress in such problems as initial purchase and maintenance costs, size of the market, noise control, economical fuel consumption, adequate range for transoceanic operations, suitable landing fields, and safe patterns in metropolitan areas," Douglas said.

IATA Group Urges 'Copter Operating Tests

Paralleling a similar recommendation of the Air Transport Association's helicopter committee several months ago, the International Air Transport Association technical committee has recommended a program of prototype testing of rotary wing aircraft under actual operating conditions.

Presenting its report at the recent IATA general meeting in Montreal, the group also recommended:

- **Flight research** into flight safety criteria and optimum approach, landing, and take-off procedures for built-up areas;
- **Better weather forecasting,** navigational facilities, and procedures;
- **Greater stability** and better control characteristics for rotorcraft at and near hovering speeds.

Civic agency participation in the development of suitable heliports and facilities, and in protecting approach paths from obstructions, was another committee recommendation.

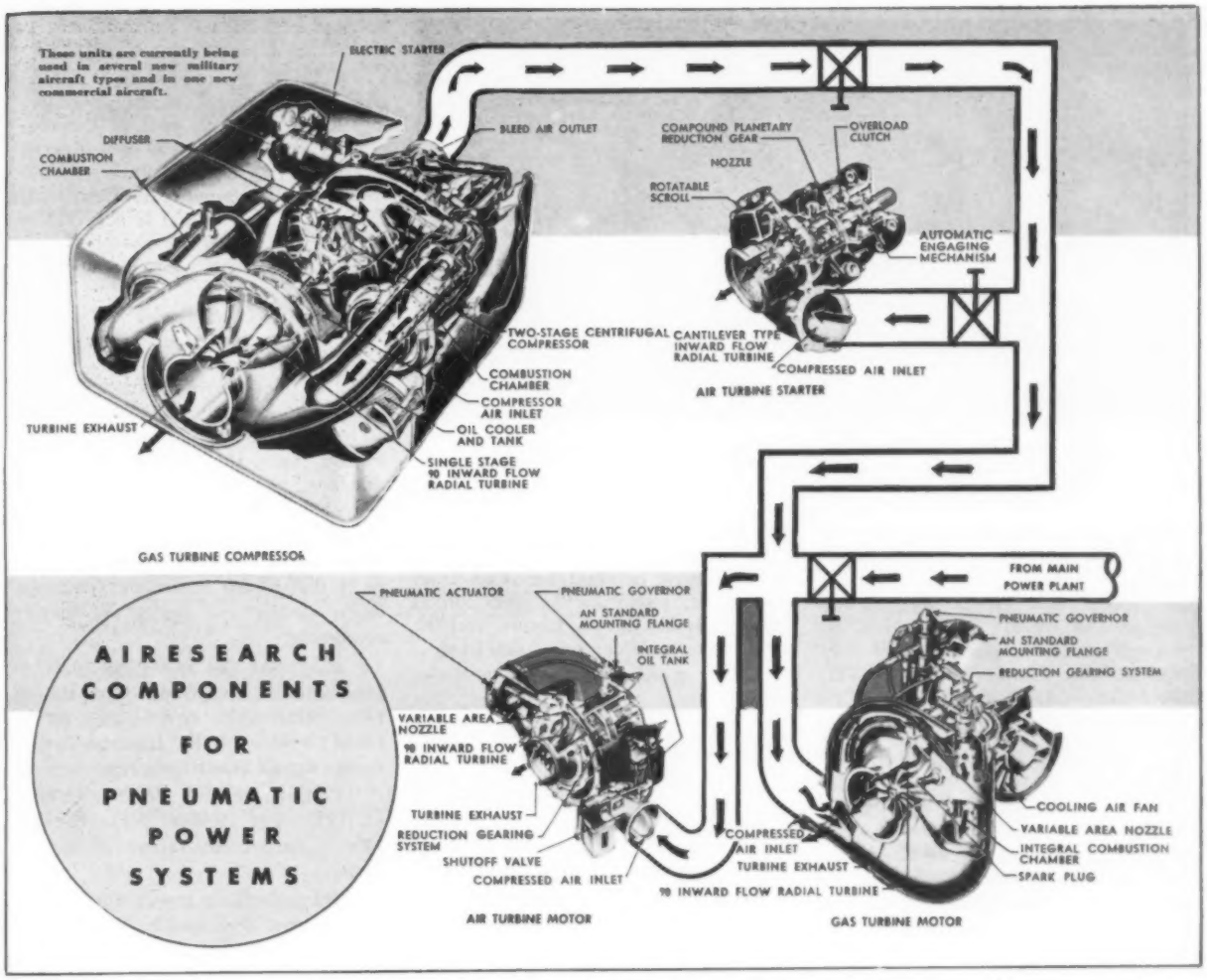
CAB Member Urges Reconsidering Act

Former CAB Member Harold A. Jones claims a "complete thorough examination, evaluation, and assessment should be made of the Civil Aeronautics Act experiment." One reason, said Jones, now U. S. delegate to the ICAO Council, is that the Act "has not brought into being a sound and efficient air transport system."

Writing in the current issue of the Northwestern University *Journal of Air Law and Commerce,* Jones looks on "independent agencies" as a whole as a "New Deal" experiment in which the three powers of government—legislative, executive, and judicial—have been united in each such agency, of which CAB is one.

Jones said the Act has not been "a "complete failure," but he indicated there is substantial room for improvement. "One thing lacking in CAB over the years," he said, "is reasonable predictability of actions."

He also emphasized the "exceedingly contradictory and anomalous situation of the Department of Commerce developing a route pattern through its power to finance and lay out airways . . . and a so-called independent regulatory commission (CAB) also planning an air route system."



SYSTEMS ENGINEERING is key to efficient use of pneumatics in aircraft design. One power source serves multiple systems.

New Accessories Spur Pneumatics Growth

Millions spent in development money begin to pay off as early service problems are licked.

By JOHN W. CALVERT

THE MODERN AIRPLANE is seven times more effective as a weapon, and carries 12 times more power than its counterpart of World War II. These increases in a relatively short period of time have necessarily resulted in significant increases in complexity. The demands for auxiliary power to operate the ever-increasing armament, radar, propulsion, guidance, and cabin comfortization system loads have increased sharply.

A new problem faced the aircraft designer. Large amounts of additional power were required without reducing the effectiveness of the main engines beyond certain restrictive limits. It was this suddenly mushrooming requirement for more and more power that gave birth to the concept of pneumatic power systems for aircraft.

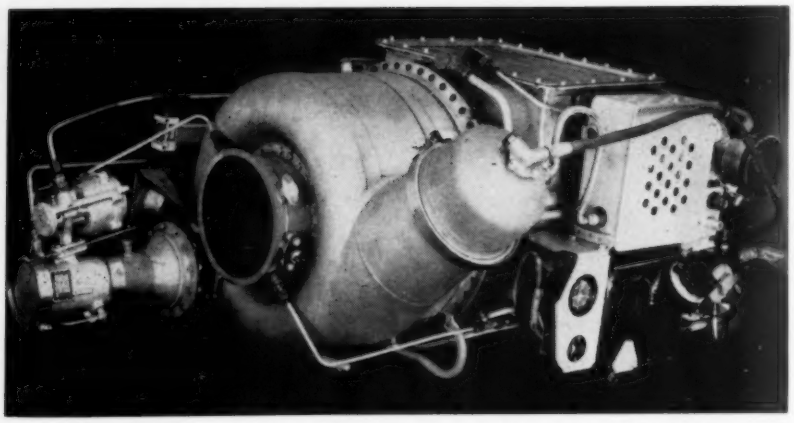
Today the development and current operational progress of individual pneumatic power units and complete systems are as dynamic and unprecedented as the advances made in aerodynamics, propulsion, and radar. An entirely new class of prime mover (lightweight power turbo-machinery) has evolved since World War II.

The major pieces of pneumatic power equipment in current operational service are:

• **Gas Turbine Compressor (GTC):** This is a packaged power plant in the below 500 hp class. It is designed as an airborne auxiliary unit to supply compressed air on the ground or in flight for main engine starting, generation of electrical power, heating, refrigeration, etc. It can also be used as a piece of ground equipment.

It is similar to a conventional turbojet engine except that the total pressure drop across the turbine is substantially equal to the compressor pressure rise, and useful energy is extracted in the form of bleed air which is diverted from passage through the turbine.

• **Gas Turbine Shaft Power Unit**



AIRESEARCH'S COMBINATION compressor-shaft power unit provides a flexible assembly for a wide variety of air and ground services.

(GTP): The schematic arrangement of the shaft power unit is comparable to that of a turboprop engine. The full compressor flow passes through the turbine, and useful work is taken out through reduction gearing. The GTP has the same compressor as the GTC, but a larger turbine to accommodate the full flow.

• **Air Turbine Motor (ATM):** The ATM uses main engine or auxiliary gas turbine compressor bleed air to drive a generator at a constant speed, or for such services as driving an afterburner fuel pump. Operational machines of this class are rated up to 175 hp, and drive generators up to ratings of 60 KVA.

• **Air Turbine Starter (ATS):** The ATS uses auxiliary gas turbine compressor bleed air to start main gas turbine engines. Multi-engine aircraft use common ducting so that bleed air from the operating main engine can be used to start the remaining engines. Equipped with multiple pads, these units can take several different forms of electrical and hydraulic energy off the one motor.

• **Gas Turbine Motor (GTM):** The GTM is similar to the air turbine motor, but operates on the bleed and burn principle. The gas turbine motor accepts compressed air, burns it in a combustion chamber to raise the level of energy extracted, and then converts this higher energy into shaft torque.

• **Systems:** In at least one installation, the Convair P5Y, a complete pneumatic power system has been in operation for over three years. This aircraft, being a flying boat, must be capable of operating independently of ground auxiliary equipment. Consequently the two gas turbine compressors aboard provide compressed air for starting the main turboprop engines and, in addition, provide compressed air for air turbine motors driving alternators when on the water. In flight, bleed air from the main propulsion engines drives these same air turbine motors, and the GTC's are used for wing anti-icing.

Each of the component parts of this system can be used independently, but the greatest weight advantages accrue when the units are combined into a system.

The inherent advantages and limitations of such pneumatic power systems were compared carefully with the problems confronting competitive systems. This investigation strengthened the competitive outlook of pneumatic power machinery because:

• **Available from the main propulsion engines,** bleed air is economical and easy to use;

• **Compressed air** is an easily controlled fluid that does not burn, doesn't freeze or congeal, and is available wherever an airplane can fly;

• **Once bleed air is used** and ducting established, the use of an auxiliary power source that produces an additional supply of the same fluid becomes attractive;

• **Auxiliary gas turbines** use the same fuel as the main engines, create no logistics problem;

• **A wide variety** of system configurations are possible to satisfy specific combinations of power, installation, and duty cycles;

• **It can be used** to supply power in any form, or in any combination of forms;

• **Its use is not affected** by cold weather.

These advantages prompted the aircraft industry, backed by the military services, to embark upon a program requiring the expenditure of millions of development dollars and millions of critical development man-hours.

Although compressed air is now an accepted operational means of supplying auxiliary power, each of the components of the system has been expected to sell itself. There are other means of starting a main engine; however, when a portion of the weight of the GTC is charged off to other services on the airplane, it is believed that no other system is as desirable.

While electric starters are used on many current fighter aircraft, and have been used as starter-generators, higher thrust engines (above 6000 pounds) and all turboprop aircraft built in the United States are currently using pneumatic starters, even though they were only developed a few years ago. For example: A 140 hp pneumatic starter weighs 28 lb, while a 15 hp electric starter weighs over 40 pounds. It appears that 35 hp is the breakpoint between electric and pneumatic starting equipment.

It appears that in the future either pneumatic or propellant type starters (the latter only now being service tested) will supply the required starting torque for all aircraft engines.

Considering that field use started in 1950, gas turbine packages have seen a remarkable variety of applications.

An interesting application is the arrangement developed by Douglas Aircraft Company for the Navy. It is intended to be carried on the outside of carrier aircraft for ferrying to advanced bases. Housed in a tear-shaped tank, it is equipped with retractable wheels so that it can be towed about the deck or airstrip when detached from the aircraft.

There have been a number of airborne GTC installations, such as the twin units installed in the Convair P5Y and the GTP in the Martin P5M.

Another illustration of the versatility of a compressed air supply gas turbine is the so-called GH4, which is a four million BTU-per-hour heater unit for preheating large bombardment aircraft under arctic conditions. It consists of a gas turbine compressor package combined with six combustion heaters.

Air turbine motors are used effectively in driving generators from 5 KVA to 60 KVA, and for driving afterburner fuel pumps. The ATM driving a 60 KVA generator is in the 135-175 hp class, while the ATM driving a 40 KVA generator on the P5Y is rated at approximately 90 horsepower. An ATM of 50 hp is used on the Douglas A3D.

Power turbines such as the ATM are rated for 100% to 200% power at 50,000 feet, which indicates that tremendous excess power (overload rating) is available at the lower altitudes.

Air turbine motors are generally divided into two basic types—the variable-area nozzle type and the inlet throttle controlled type. The variable-area nozzle gives higher efficiency and reduces air consumption, thereby minimizing bleed penalties to the main engine. Consequently it has been favored, particularly for higher horsepower drives, where its use shows up to greater advantage. The cost vs. efficiency break-point between the variable-area nozzle and the inlet throttle type appears to be in the neighborhood of 25 horsepower.

One of the big problems has been to perfect automatic controls that will prevent the misuse of these machines by unskilled operators.

Field experience to date has been that the gadgetry involved in automaticity has proved much less reliable than the basic gas turbine. Even so, the nature of the machine is such that this automaticity is still preferable to normal operator control. One redeeming feature is that piston engines with a similar degree of automaticity have overcome various comparable development troubles.

Trend Toward Packaging

The trend in packaging is to reduce weight by enclosing only the hot parts of the turbine and nozzle box in a compressed air plenum chamber. Thus the maximum surface temperature of any part of the gas turbine, except the exhaust flange proper, is only slightly higher than that corresponding to heat of compression of the air, which is less than 500° F. This "cool skin" construction is a major safety factor. It eliminates hot surfaces and, should the outer skin of the gas turbine be pierced by a projectile, the leakage would consist of compressed air at heat of compression rather than hot gases.

Another feature of new designs is the use of a single combustion chamber. This eliminates dual ignition and any need for cross-firing means or fuel flow equalizers. The arrangement of the combustor is such that the removal of a single clamp permits immediate withdrawal of the flame tube and inspection of the turbine nozzles.

In general, internal changes have reflected need for higher gas and air through-flow rates. Design improvements have already been made to eliminate sensitivity to extreme thermal shocks.

For equal diameters and only a 20% weight increase, turbine wheel power outputs have increased from 175 hp to 450 horsepower. Similarly the specific heat release of combustors has gone up from six million BTU-per-hour per cubic foot to eight million, compared with the five million applicable to a current production jet engine.

The trend in small gas turbines is toward simplicity, reliability, and adaptability, with fuel consumption and frontal area being of secondary importance. Improvements in fuel consumption that could be achieved with more complexity, it appears, would not offset the consequent increased cost and reduced reliability.

Several organizations have spent a good deal of time and money in the development of pneumatic power units and now share in the production. One of the major contributors to pneumatic developments has been the AiResearch Manufacturing Company, a division of The Garrett Corporation.

An Early Start

AiResearch experience in the research, development, and production of many related aircraft components and systems influenced the company to make an early start in this field. Its engineers and production specialists developed and produced the first air cycle refrigeration turbine for aircraft, and have been successful in the development and production of cabin pressurization compressors for the airlines.

AiResearch activities in research, development, and manufacture of electric actuators, cabin pressure control valves, temperature controls, electronics, and heat transfer equipment have all contributed to the total development of the packaged gas turbines.

Specialized engineering teams have contributed such vital components to the gas turbines as: Low and high pressure pneumatic-electric starter motor and ignition switches, pneumatic overload control units, pneumatic temperature control units to monitor turbine temperatures, special oil coolers, automatic starter air control valves, and pressure regulating valves.

As starting torque horsepower requirements move upwards, as electrical loads continue to increase, and as ground power requirements continue to grow, the advantages of pneumatic power become even more attractive. And as continual refinements are made and experience is gained on present equipment, further strides are being realized in increasing simplicity and reliability, and in lowering maintenance costs. It appears that the newer equipment will more and more take the form of combination units.

Although gas turbine motors have gained only limited flight experience at this time, it appears that their increased efficiency in relation to air turbine motors will produce a growing demand for them.

The basic prime mover is now taking the form of a combination compressor-shaft power unit (GTCP). It provides an output shaft for generator drive in the same manner as the GTP, and also provisions for bleed air of the heated type. Although the two maximum ratings of the GTCP (bleed and shaft power) are not available simultaneously, reduced outputs of both shaft power and bleed air may be extracted at the same time, resulting in a versatile machine for generalized service.

Larger aircraft can carry the full weight of a GTCP along with air turbine starters, and either air turbine motors or gas turbine motors. Such use of a GTCP supplying all ground electrical requirements while the main engines are inoperative, and at the same time supplying cooling or heating air through the airplanes' air conditioning system, enables the aircraft to be completely self-sufficient. The unit can then be used to supply starting power through the air turbine starters. In flight it can be used for intermittent electrical and compressed air duties, with bleed from the main engines carrying the bulk of the accessory load through the air or gas turbine motors.

External Pod Mounting

While impractical for internal use by lightweight fighter aircraft, the same unit can still be used effectively. The GTCP can be mounted in an external store pod, in which form it can be carried on the pylons of fighters and ferried to an advanced base for use as ground equipment. The GTCP can keep the radar alive, the engine warm, and the cockpit either cool or warm (as required), and at the same time be ready to crank up the main engines on an instant's notice.

The basic advantages of the auxiliary gas turbine and associated power turbo-machinery have become increasingly attractive as reliability and simplicity of maintenance have been increased through growing experience.

The firms in this specialized field now generally believe that within three years small gas turbines will be the equivalent in service life and reliability to piston engines weighing two to three times as much, and in equal production quantities will be able to compete in cost with piston engines. • • •

Interview

F. E. Newbold

General Manager
Stratos Division

Fairchild Engine and Airplane Corp.

Pneumatics For Tomorrow's Transports

F. E. "Gene" Newbold at 35 is considered to be one of the industry's youngest top executives, serving in the combined post of vice president of the Fairchild Engine & Airplane Corp. and general manager of its Stratos division. The latter post he has held since 1949.

He joined Fairchild's engine division in 1940, directly after graduating from Princeton with an engineering degree. Prior to his present position he was representative for Stratos and the engine divisions on the west coast and, later, manager of engineering operations for the engine division.

Under his management the Stratos division, through diversifying and increasing its line of pneumatic accessories, has grown from 100 employes to about 800.

Newbold, a native of Devon, Chester County, Penna., is a member of The Institute of the Aeronautical Sciences and the Society of Automotive Engineers. He lives on the south shore of Long Island.

Q. HAS the jet's impact on aircraft accessories, such as Stratos manufactures, been as great as its effect on the basic airplane?

A. At least as great. The introduction of the jet engine opened a new source of energy to serve accessories: compressor bleed air. At the same time, space limitations and the configuration of the jet engine sharply reduced the number of pads available for mounting accessory drives. As a natural result, the energy of air bled from the jet engine compressor has been used for various aircraft requirements. Higher speeds made possible by the jet engine have also greatly affected accessory requirements.

Q. What are some of the principal uses made of this bleed air?

A. The first and most obvious was the piping of compressed air to the cabin to pressurize it. Since bleed air temperature is too high to be introduced directly into the cabin, it has to be cooled. This was accomplished with simple air-to-air heat exchangers. As bleed temperatures rose higher and cooling requirements for the cockpit became greater, refrigeration turbines were added. For instance, we ourselves have built cooling units ranging in capacity from 10 pounds of air per minute to as much as 100 pounds of air per minute.

Three Possibilities

Q. Cooling systems are not the only application of bleed air; there are correlary developments, aren't there?

A. Yes. Development of small, high speed turbines for cooling purposes drew attention to the fact that air turbines might be a convenient source of power. The lack of available engine pads, as well as the flexibility of installation, were factors in attracting interest to bleed power units. Three possibilities were immediately apparent. Basically they are:

- A turbine operating entirely on compressor air;
- A turbine operating on bleed air from the compressor which has its energy level raised by the burning of additional fuel—the so-called bleed and burn system.
- Use of the cooling turbine as a power supply.

They have, however, some inherent limitations.

Q. You mention inherent limitations. What, in general, are they for each of the three possible systems?

A. The last mentioned—use of the cooling turbine as a power supply—presents an extremely complex control problem. The power and the cooling requirements must be met by the same unit. While such a system would be attractive because of weight and space savings made possible by having the unit serve a dual function, the difficulties appear to preclude its wide usage. The first system —straight bleed air turbines—is relatively convenient, although the control system must be very accurate and have a rapid response rate. Turbine inlet temperatures are moderate, which permits the use of common materials. The major design problem is the economical use of bleed air.

"... Operators are Strongly against this type system"

since the accessory drive must produce its rated power over a wide range of bleed pressures and temperatures, these varying with engine and airplane speeds. In larger units, variable nozzles would appear attractive to conserve bleed air. The bleed and burn system is economical in its use of bleed air, but adds complications which to a great degree offset this advantage. Addition of heat by burning fuel in the bleed air can even cut the variations in the energy level of the gases going to turbines at various flight conditions. However, control complexity, the fire hazard, the additional weight required in the form of fireproof enclosures and similar safeguards, appear at this time to outweigh the advantages. Many airplane manufacturers and most operators are strongly against this type of system because of the dangers inherent in a fire outside of the engine itself.

Q. For what functions are accessory power drives most likely to be used?

A. A bleed turbine can be used for many different purposes. Among them are alternator drives, with the alternator driven either through reduction gearing or mounted on a common shaft. Speed controls for such an alternator drive can be completely pneumatic and can maintain alternator output frequency with great accuracy under varying flight conditions and variations in alternator load.

Other Applications

Other applications, either currently in use or considered, include operation of hydraulic pumps, fuel transfer pumps, water injection pumps, in-flight refueling pumps and mechanical actuators. The latter are used in the operation of such things as dive brakes, flaps, landing gear, bomb bay doors, etc.

Turbines are already being used in some of these applications in military aircraft. They offer advantages in space savings and systems weight and benefit by their adaptability to remote location.

Objections have been raised, however, to the increasing amounts of compressor air required and to the piping of hot compressor bleed air around the aircraft, particularly in commercial jet transports. On the other hand, hot air anti-icing ducts throughout the aircraft may, in some cases, be tapped as a supply for the pneumatic turbine. This leads to a considerable weight saving.

Another use of this type of turbine is as a standby unit in case of the failure of normal hydraulic or electrical drives. This application, of course, is restricted to multi-engine aircraft.

Q. What about emergency accessory drives for single-engine aircraft?

A. In the case of single-engine airplanes, turbines operated by ram air seem to be in order for emergency drives. Such turbines would provide power as long as the airplane moves. They can be designed to operate at speeds above Mach 1.

A ram air turbine could be stored inside the airplane and swung into the air stream only in an emergency, thereby adding nothing to the drag of the airplane when not in use. Ram turbines can be made to supply hydraulic or electrical energy sufficient to serve accessories necessary for bringing the airplane down for an emergency landing.

There have been numerous cases of fighter aircraft which have remained aloft after losing their power sufficiently long to completely deplete the battery. With ram turbines, the size of the battery could be reduced, hence it appears that they can be added as a safety factor at no increase in overall weight.

Q. The question of contamination of the bleed air has been raised. Has consideration been given to this problem in association with air conditioning systems for jet aircraft?

A. Contamination may be caused by either injection of liquids in order to boost power or by oil leakage into the compressor air through the seals. Depriving air conditioning systems for jet aircraft of compressed bleed air will necessitate development of new equipment. This new equipment would necessarily differ from present pressurization and air conditioning practices used in transport aircraft powered by reciprocating engines. Due to the higher operational altitude of the jet transport, cabin compressors, if used, will be extremely complex, heavy and costly. In my opinion, every effort must be made to eliminate the contamination at its source. If this can be done, we will eliminate a complex mechanical unit from the aircraft's maintenance schedule.

For cooling today's transports, one of three systems is used: the air cycle system, the freon system, and a combined system. Air for cabin pressurization is provided by either an engine-driven compressor or by bleeding from a turbo supercharger.

Combinations of air-cycle/vapor-cycle cooling units are being developed and arranged so that each portion of the system can operate independently when desired. Considerable flexibility is obtainable. The low power requirements of the vapor cycle make this type of cooling equipment attractive where ground cabin air conditioning is required.

Bleed Air Problem

Q. Is your experience with military jet aircraft applicable to civil jet aircraft?

A. The primary benefit of our past experience as applied to future commercial jet transports may not lie in using existing equipment, but in the application of the knowledge gained in the development of bleed air equipment for military airplanes.

In the consideration of accessories for jet transports a very important decision has to be made, i.e., "to use or

not to use" bleed air. This decision will establish the type of equipment and the proper answer will be an important factor in the development of successful jet transports.

Accessories in such aircraft will not be "things added after the airplane is built." In many cases the accessory will be just as important a factor in the safe and economical operation as the basic airplane. In the case of pressurization for very high flying jet transports, the equipment must have the same reliability demanded of a wing, for example.

Q. What effect does diverting bleed air have on engine performance?

A. The prime objective of the engine manufacturer in designing his engine is to develop thrust for airplane propulsion. The use of bleed air is a nuisance to him. Bleeding one per cent of air from the engine reduces thrust by roughly two per cent. There are, however, other factors of weight and simplicity which tend to even the score, and in the final analysis, the engine provides the most efficient source for compressed air for pressurization. This is not always true in the case when the air is used to drive some other accessory. This is a more complex problem for which no general solution can be found. Each application must be studied with due consideration to length of mission, air consumption, duration of accessory operating cycle, etc.

Freon Systems

Q. If bleed air is not available for cabin pressurization and air conditioning, what are the alternatives?

A. There are many different possibilities. The compressor supplying cabin air may be mechanically driven from an engine pad or may be driven by a bleed air turbine. Due to safety requirements, two or three compressors, each capable of maintaining the required cabin pressure probably will be installed. At the altitudes jet transports would operate, these compressors will have two or even three stages if centrifugal designs are used. Roots type or similar positive displacement compressors are a possibility, particularly with mechanical drive. As mentioned above, these units will be much more complex, heavy and expensive than current units.

Cooling may be accomplished by freon or combination freon and air cycle systems. The jet aircraft will require a high pressure ratio and impose greater cooling loads on the equipment, but the same basic principles are satisfactory to meet them.

The vapor systems (i.e. freon) requiring as they do only about 1/5th to 1/10th of the power of the air cycle system, are likely to attract great interest since they can be operated economically on the ground if electrically driven. Present freon systems patterned after commercial equipment are too heavy, but lightweight, compact equipment suitable for aircraft is currently being tested.

Most of the popular vapor cycle systems use freon, but other gases may prove more attractive for aircraft applications. All will pose a high temperature limitation in that condensation temperatures above 250° F. are not practical. For the immediate future this will not create any great difficulties, since the aircraft speeds will not be high enough to preclude use of air cooled condensers. (Present day fighters in high speed operation under summer day conditions experience cooling air temperatures of around 200° F.) When greater speeds are encountered, artificial heat sinks, such as the fuel, evaporation of water, etc., may be used.

Q. What are some of the drawbacks hindering driving of accessories directly from the engine?

A. There are definite limitations on practicability of direct mechanical drives, since the jet engine is tightly cowled and has a limited number of pads. In addition, bringing mechanical power into the airplane from pod-mounted engines imposes some difficult engineering problems, plus increased pad drag, if space is allowed for all accessories. Consequently, the air bleed power turbine will have its application in the jet transport.

Q. What will be the cost of accessories for jet aircraft in comparison to present equipment?

A. Cost probably will be considerably higher. Much more is demanded of the equipment both in the way of performance and reliability. In addition, testing—both developmental and production—requires installations heretofore undreamed of in connection with accessory equipment.

Power Requirements

While not as extensive as test equipment required for jet engines, very high air flows are required and duplication of altitude conditions with pressure equivalents of 60,000 feet may be needed. Since these conditions must be created with flowing air, they demand considerable power and intricate control and metering equipment in test cells.

Q. Has Stratos developed any equipment for military jets which might be directly applicable to jet transport aircraft?

A. I believe so, but to a limited extent. Our air cycle refrigeration units for large bomber aircraft are approximately the size which, at least in the initial stages, jet transports will need. We are, of course, studying new pressurization and air conditioning systems directly related to jet transport aircraft. So far it has been difficult to establish just which way the industry will go on the approach to this problem. Operating experience on some of the new model jet engines just going into military service will materially affect this approach. The conclusions and recommendations of the CAA will also be a major factor in the final decision. Whatever direction the development may take, our experience will be available to help maintain the supremacy of American civil and military aircraft. • • •

News Briefs

Lear, Inc. has established an aircraft service division, based at Santa Monica Municipal Airport, with Arthur W. Cruse as general manager. Division will provide service for executive and other aircraft and will handle Lear's speed conversion of the Lodestar, as well as sales.

•

Group of aircraft instrument sales and service companies have formed the National Association of Aircraft Instruments, with offices in a Pacific Airmotive Corp. building in Burbank. C. C. Smith of Aerosmith Instrument Co. in Hawthorne has been named chairman of the working committee to set up policies and procedures.

•

Northwest Airlines has begun a six-month service test program with seven P&W R-4360 CB-2 engines. Aim is to establish reliability with an eye toward replacing the R-4360 B-6's currently used on its fleet of 10 Boeing B-377's.

•

Air Coordinating Committee postponed October 9 meeting of Washington, D. C. area airport operators until CAB has prepared its proposals on the pending one-year test in the area, ultilizing special flight procedures for high density traffic.

•

An approximate $400,000,000 commercial and military Constellation backlog is reported by Lockheed Aircraft Corp., with sales to date totaling $265,739,176. Lockheed states that more Connie transports are in production or on order than at any time since the plane first flew in 1943.

•

Shell Oil Co. has concluded a contract with Eastern Air Lines for delivery of about $35 million worth of avgas to New York, Washington, Atlanta, and other EAL route points. Deliveries begin February 1 and presumably the contract will meet a major part of the carrier's requirements for grade 100 and 115 avgas for two years or more.

•

Courtlandt S. Gross, executive v.p. of Lockheed, reports that first year experience with the divisional set-up aimed at separation of long-range policy-making from operating responsibilities has resulted in tangible benefits. In 12 months, the California division has turned out sales of nearly $560 million, Georgia division $160 million, and Lockheed Aircraft Service $27 million, with Lockheed Air Terminal revenue reaching $4 million. Total employment is now at 54,640.

•

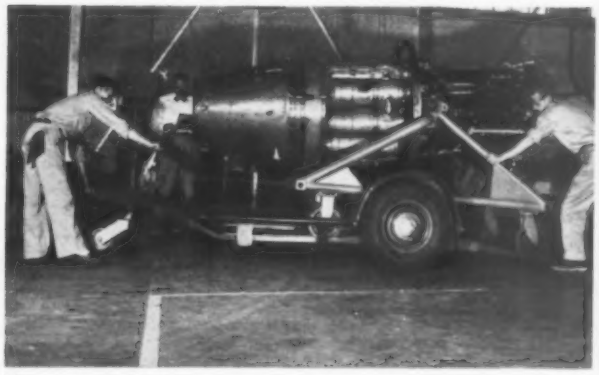
A Carrier Payments Unit has been established by CAB to handle disbursements and accounting of airlines' monthly claims for subsidy mail payments. To be staffed by seven people, unit comes under the Budget and Fiscal Section of the Secretary's office.

•

Bendix Aviation Corp. is building a **new plant at Teterboro, N. J.,** for its Eclipse-Pioneer Division. The 103,250-square-foot building, to be completed by October, represents largest single expansion in Bendix north Jersey manufacturing facilities in over 10 years.

1. BEFORE SHIPMENT to G-E Strother Field Modification Shop, engine removal is handled by aircraft maintenance personnel. Engines are packed in "cans," then loaded aboard trucks.

2. ARRIVING AT STROTHER, engines are unloaded by experienced G-E crew. Shop is convenient to mid-West USAF bases and Boeing, Douglas, and Convair plants.



3. INTO THE SHOP goes this J47-23 on a specially-built dolly. Engine will get new parts to bring it up-to-date with latest models.

How G.E.'s Strother Field Modification Shop Helps USAF Achieve

Maximum jet engine life at minimum cost

As part of a world-wide jet service organization, a small, busy General Electric jet service shop near Winfield, Kansas, now helps our Air Force stretch out the service life of J47 engines.

G.E.'s Strother Field Modification Shop performs minor repair and modification work on J47 turbojets. The shop's efficient service and careful use of factory techniques help the Air Force get maximum service life from its J47s . . . and at minimum cost.

Work done at Strother Field ranges from repairs on engine parts such as cross-fire tubes, tailcones, combustion chambers, etc., to major engine modification. In "modification," new improved or re-designed parts are installed to bring previous years' J47 engines up-to-date with the latest G-E production models.

Like the Strother Field Shop, other G-E jet service shops are in operation at Los Angeles and Evendale, Ohio. In addition, G-E tech reps are available at 65 key locations within the U.S. as well as abroad. Their work assures top G-E engine performance at all times. Section 230-8, General Electric Company, Schenectady 5, N. Y.

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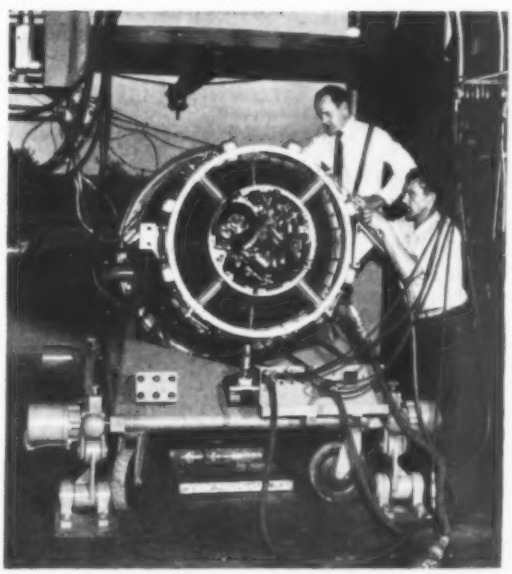
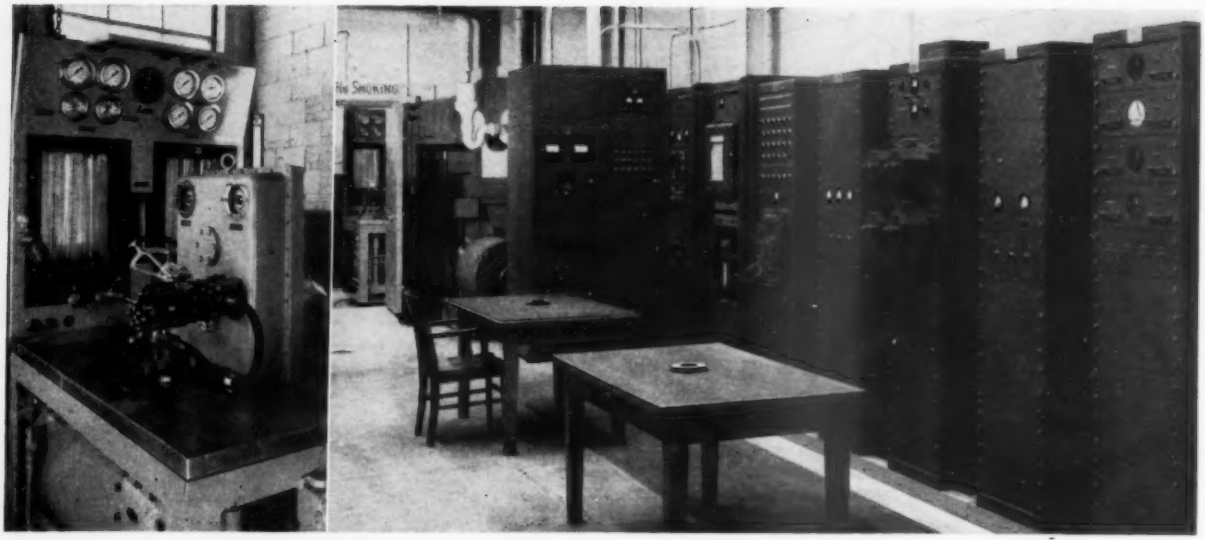


4. OUTDOOR TEST CELL at Strother makes certain that performance of newly modified engine is perfect. Efficient G-E service has helped USAF conserve manpower at nearby overhaul bases.



DEVELOPMENT VERSION of Vickers jet engine fuel control simulator duplicates flight conditions for any type jet engine. Test stand (left) mounts fuel control unit for test.

Hydraulics: From Sonic to Thermal Barrier

Mach 2 designs demand higher temperatures and higher pressures; market seen expanding.

By Joseph S. Murphy

AIRCRAFT HYDRAULICS, the business of operating aircraft systems and components by fluid power, first entered the aviation scene on a really large scale in the mid-1930's with the Douglas DC-3. Today it is meeting a new challenge in the transition to the era of jet-powered aircraft. From observations of the engineering and development activities at Vickers, Inc. of Detroit, Mich., a name that has become virtually synonymous with hydraulics in aviation during the past 10 years, it is apparent that the industry is not only meeting the challenge of the jet, but is actually widening the scope of hydraulics in aviation.

From limited use in the DC-3 landing gear, flaps, and brakes, hydraulic systems have spread until in the jets they now power new dive brakes and sometimes provide the sole source of aircraft flight control system operation (as in the de Havilland Comet, the only jet transport now in operation). Quick-response hydraulic circuits are being engineered for an almost unlimited future in the field of servo systems. Hydraulic pump and motor combinations are being selected as the drive that will assure a constant frequency alternator output in new 100% a-c aircraft electrical systems.

But this transition to the jets has not been a simple one for the hydraulics engineer. In fact the real work still lies ahead. The supersonic jet fighters and bombers now being planned and the Mach 2 and Mach 3 designs on the drawing boards already pose new problems to challenge the survival of hydraulics. Pointing up these problems, Vickers' chief engineer James Robinson cites these new demands that the high-speed, high-altitude, jets present:

• **High temperature systems:** System operation in the temperature range between —70° Fahrenheit and plus 170° F. has become a thing of the past. Some production military jets are now operating with 250° systems, but the real military needs call for a hydraulic system operating at 550° temperatures, opening up a world of problems.

• **High pressure systems:** High-speed jet aircraft by their inherent design can no longer tolerate generous space provisions for large actuators, and the armed services are looking for smaller actuators operating at pres-

The Growing List of Jobs for Hydraulic Power in Aircraft

1. Landing gear, retract & extend
2. Landing flaps, retract & extend
3. Wheel brakes, power
4. Nose wheel steering
5. Cowl flaps, open & close
6. Propeller pitch control
7. Control surfaces, power boost
8. Dive brakes, open & close
9. Cabin compressors, direct drive
10. Cabin compressors, speed control
11. Cooling fans, drive
12. Alternators & generators, direct drive
13. Alternators & generators, speed control
14. Pneumatic pumps, drive
15. Pneumatic pumps, speed control
16. Gun turrets, azimuth & elevation
17. Fuel pumps, drive
18. Fueling booms, control
19. Bomb bay doors, control
20. Wing incidence, control angle of
21. Passenger ramps, raise & lower
22. Rocket magazines, extend & retract
23. Hoisting device for helicopters
24. Hoisting device for lighter-than-air
25. Cockpit enclosures, open & close
26. Jet engine nozzle control
27. Windshield wiper power
28. Radar scanner drives
29. Tow target control
30. Pilot seat adjustment
31. Wing fold control
32. Missile controls
33. Boundary layer control
34. Leading edge flap control
35. Stabilizer position control

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sures up to 5000 psi. Current 3000 psi systems, long recognized as the optimum from the standpoint of weight per horsepower produced, will give way where these demands prevail.

Most problems surround the development of higher temperature systems, according to Robinson, but they are not considered insurmountable. For hydraulic system components, the 550° temperatures will mean added weight in body construction to compensate for the drop in strength due to the higher temperature. For the steel, bronze, and aluminum or magnesium alloys commonly used in today's systems some changes will be in order. Although no problem is anticipated with the steels or with the newer magnesium-zirconium alloys, bronze bodies may have to be made heavier, by added metal or by reinforcement through casting in steel sleeves.

Spring materials are particularly critical to higher temperature operation. Those now being considered which primarily call for the use of monel are considerably larger than present units, another factor that will tend to increase component size.

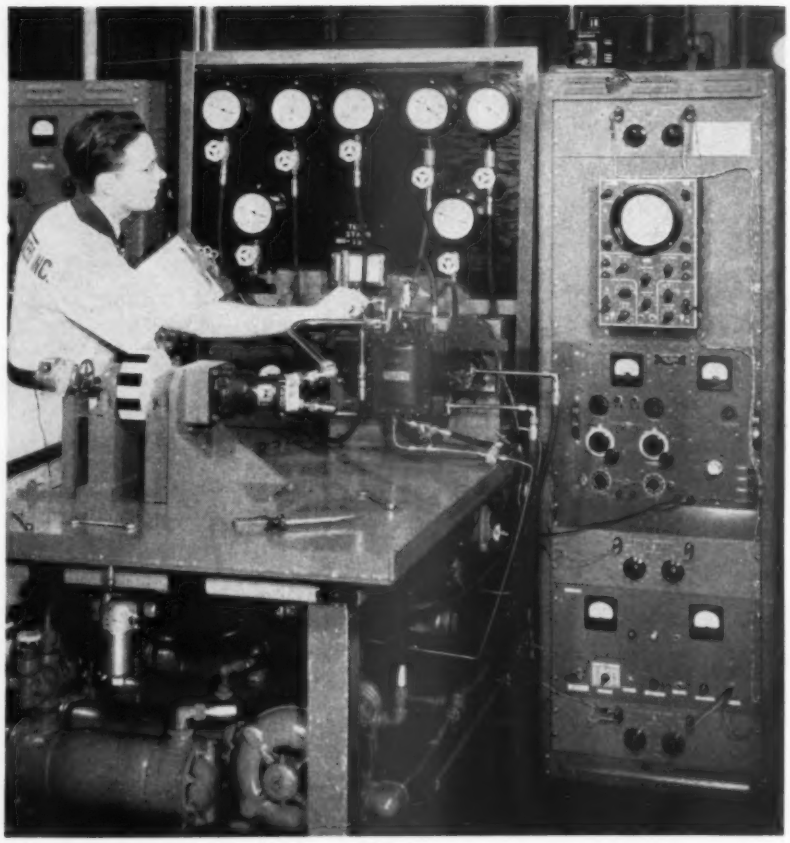
One of the more critical problems presented by the 550° system, and the one which presents the biggest challenge, is that of sealing against fluid leakage, both internal and external. During the past few years the use of du Pont's Telflon has permitted great advances in the field of hydraulic sealing, to the extent that both civil and military operations have often resorted successfully to back-fitting critical components with Telflon seals where leakage has been a chronic problem. At Vickers success has been reported in its use under temperatures as high as 465° F. in a hydraulically driven radar antenna for shipboard use, in a manner that could be directly applied to an aircraft installation.

But the top temperature for the present stage of Telflon development is seen at 500° F. where compression set characteristics become poor and rapid wear begins. Although considerable effort is being directed toward the development of even higher temperature seal materials, alternate methods of sealing being investigated by Vickers include the use of hollow metallic "O" rings and the metal-to-metal face seal.

For the higher pressure system designed to meet the critical space requirements of the compact jet fighter the problems are fewer. The only major change contemplated here is one calling for system tubing of heavier wall thickness or stronger materials to withstand the higher pressures. Other trends for such a system design, however, point to increased use of cylindrical instead of spherical hydraulic accumulators, and to designs which include system valve functions in the bodies of hydraulic motors.

In hydraulic pump development the advent of the jet engine with its high compressor shaft speeds has added new requirements. Where the accessory drive take-off pad on the reciprocating engine turned in the order of 1.4 times the speed of the engine, or about 3750 rpm, the jet engine accessory take-off operates at 0.6 times compressor speed, or roughly 6500-7000 rpm. The result has been an increasing demand for higher speed pumps to eliminate the use of a step-down gearing arrangement between the pump and the engine accessory drive.

At Vickers present pumps have been designed with a speed range from 3100 rpm for the larger models to as high as 9100 rpm for the smallest unit. Laboratory tests have shown that in special installations where the life of the pump can be sacrificed for greater performance, this small pump could be operated at 12,000 rpm. For use of extremely short duration (where the unit

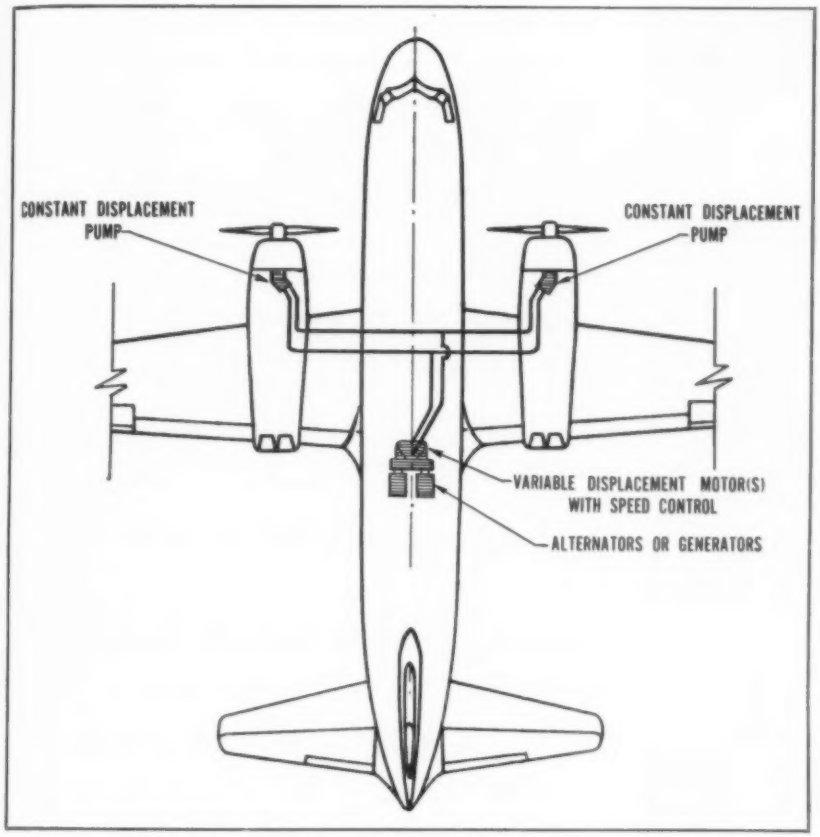


LABORATORY TECHNICIAN checks servo system response using striped disc at left as dummy load. In typical test system is accelerated from zero to 2000 rpm in 0.021 seconds.

Behind Today's Performance

Vickers Incorporated, a division of the Sperry Corp. first entered the aircraft hydraulics field in 1938 with the design of a vane-type hydraulic pump for the North American B-25. The company's activities in aviation were greatly expanded during World War II, and today Vickers stands without a single competitor that offers as wide a variety of hydraulic products as it does, although the company is faced with extensive competition in each specialized field.

As a service to the aviation industry, in 1951 Vickers inaugurated the sponsorship of an annual Transport Aircraft Hydraulic Conference, offering an opportunity for specialists representing civil and military operators of transport aircraft to meet and discuss service problems and new developments in aircraft hydraulics.



CONSTANT SPEED hydraulic drive shown here in schematic layout assures constant frequency output in a-c aircraft electrical systems.

would be considered expendable), operation at speeds as high as 20,000 rpm is possible.

Although Vickers has a continuing development program devoted exclusively to the design of pumps that will operate in the 6000-8000 rpm range, by means of a redesign of the diameter of the cylinder block kidney slots in most pumps now being produced the company has been able successfully to engineer a 15% increase in operating speed within the past two years.

Another of the larger areas of Vickers development in hydraulics today is in the field of servo systems, where a typical application of a hydraulic motor acting as a servo device calls for accelerations from zero to 2000 rpm in about 1/50th of a second. According to engineer Norton Williams, servo systems that call for an output in the range from one to one hundred horsepower are best suited to the use of hydraulics, and within this range it is both difficult and impractical to match system performance being produced by hydraulic means with any non-hydraulic system.

The type of servo system being engineered at Vickers is one in which a servo hydraulic pump is driven by a constant speed external source and its output is controlled by input signals which tell the mechanism to do a given job, as well as by feedback signals that reports what is taking place at the working end of the system. In a typical problem with present-day development the effort to improve hydraulic servo system operation is along the lines of widening its range of speeds.

For example, in the use of a hydraulically powered system to drive a radar controlled airborne gun turret, the goal is to provide a system that will come the closest to 100% smooth operation as the turret follows the target.

Where turret installations today have hydraulically controlled systems with a speed range of 1000 to 1, meaning that they can be operated at a rate of speed anywhere in the range from 1 rpm to 1000 rpm, or perhaps 0.1 rpm to 100 rpm, the goal is to design a system with a speed range of 10,000 to 1.

NEW VICKERS hydraulic motor operates at constant speed regardless of flow variation.

The net result of this type of development will not only be to decrease the time lag between the radar signal which controls turret motion but also to further reduce the "cogging" or hesitating action that still exists in today's systems.

In other Vickers developments:

• **A special laboratory facility** is being set up exclusively for development work in the constant-speed hydraulic drives which are now coming into great demand in the swing from d-c to 100% a-c aircraft electrical systems on most new military aircraft.

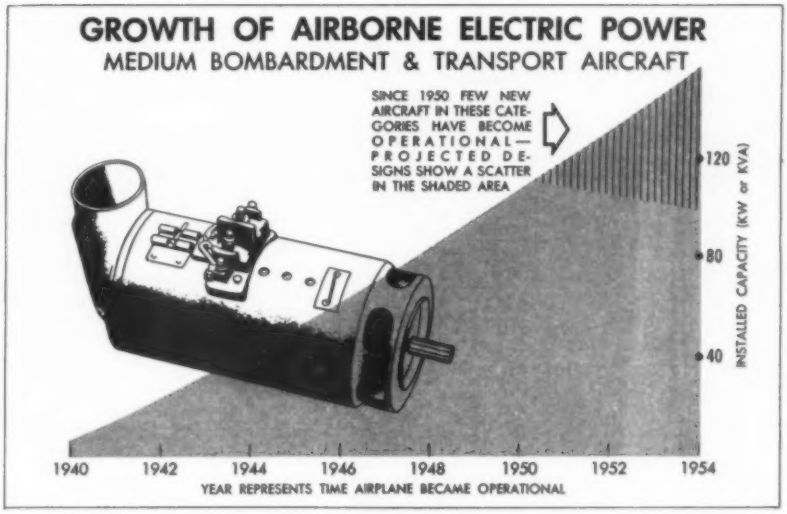
In this type of system a hydraulic drive is used to insure the constant frequency output of an airborne alternator or generator, which is critical to the performance of an a-c electrical system. The Vickers design uses a fixed displacement hydraulic pump driven by each engine and supplying hydraulic pressure to a variable displacement motor and speed control device. Should an engine failure occur, the remaining power source will still permit a partial output at the alternator end, all the time maintaining constant frequency output.

The success of Vickers hydraulic developments in this field is borne out by the fact that they are being used in lighter-than-air designs as well as in jet fighters and transports, with five models now flying with the system installed.

• **The company has spread** its development activities into the core of the jet engine business by winning a U. S. Navy Bureau of Aeronautics competition for the design of a jet engine fuel control simulator and an estimated $500,000 contract for its production.

The unit designed by Vickers is made up of a 100 hp variable speed hydraulic transmission to drive a fuel control unit under test, a d-c generator, and a Potter flowmeter, which feed shaft speed and flow information into an analog computer, and the computer unit itself, which will duplicate the many variables encountered in jet engine flight operation.

The big advantage of the Vickers-designed simulator is the saving it promises to bring to the calibration of jet engines, where costs today are estimated as high as $5000 per engine in fuel consumption and engine wear and tear. With the new simulator these costs will be cut to about two per cent of their former value, company officials estimate. • • •



STEADILY INCREASING use of electrical power in aircraft is shown in above chart.

The A-C Power System Comes of Age

Some 75% of aircraft now under development will use alternating current power as the prime electrical source.

ELECTRICAL POWER requirements for aircraft, which have been on the upgrade for the past 50 years, show signs of further increases in years to come. The Boeing B-52, now in production, may possibly represent the peak electrical requirement likely in the immediate future.

This does not mean developmental demands on the manufacturers of aircraft power generating and regulating systems will ease up. The problems of supplying existing power requirements in the proper quantity, frequency, voltage, and phase at the smallest possible cost in dollars, in weight, and in space, are becoming more demanding. The power peak reached in the B-52 promises to apply to other military and commercial aircraft in which economic and weight limitations are even more restrictive.

These are some of the factors apparent from a survey of one of the country's leading manufacturers of aircraft electrical equipment—General Electric at Schenectady, New York. G.E. is one of the big four supplying this type of equipment to the military services and the civil operators. The others include Eclipse-Pioneer, Jack & Heintz, and Westinghouse. Each of the four firms holds a reasonable proportion of the business.

Radical Developments

The past few years have seen some radical developments in aircraft power:

• **The switch from direct current** to alternating current systems has been widespread. Some 75% of power systems now under active discussion for airplanes under development will be a-c systems.

• **Swing to a-c systems,** even in fighter aircraft where some of the strongest opposition to complete a-c operation was encountered, is so complete that one Navy plane, the Douglas A4D, is being built without a battery.

• **The 120-volt, direct-current system,** which showed promise of competing with a-c systems, has suffered a serious setback. The Northrop F-89 is the only plane ever to be equipped with a complete 120-volt, d-c system, although the Lockheed Constitution made some use of this type of power.

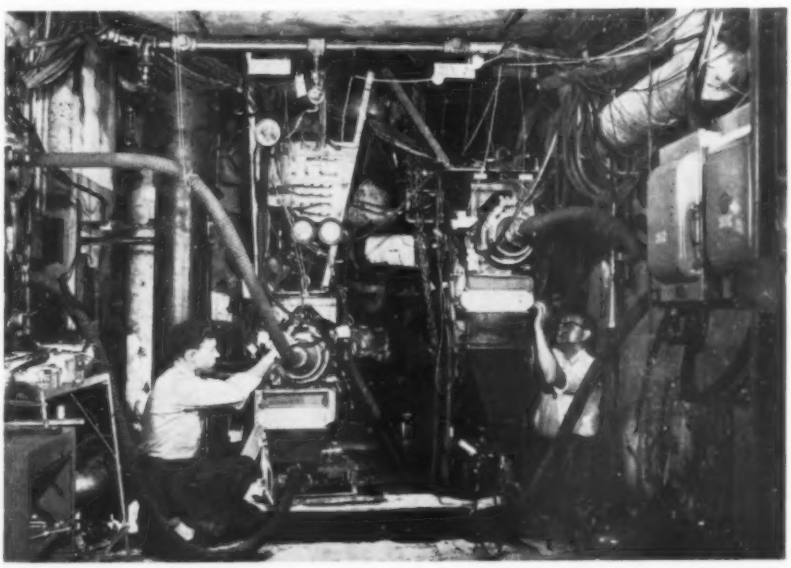
• **Inverters and dynamotors** are largely disappearing from new aircraft types due to the inherent characteristics of alternating-current systems.

• **Availability of effective constant-speed drives** for alternating-current systems promises to expedite the industry's swing to this type of power.

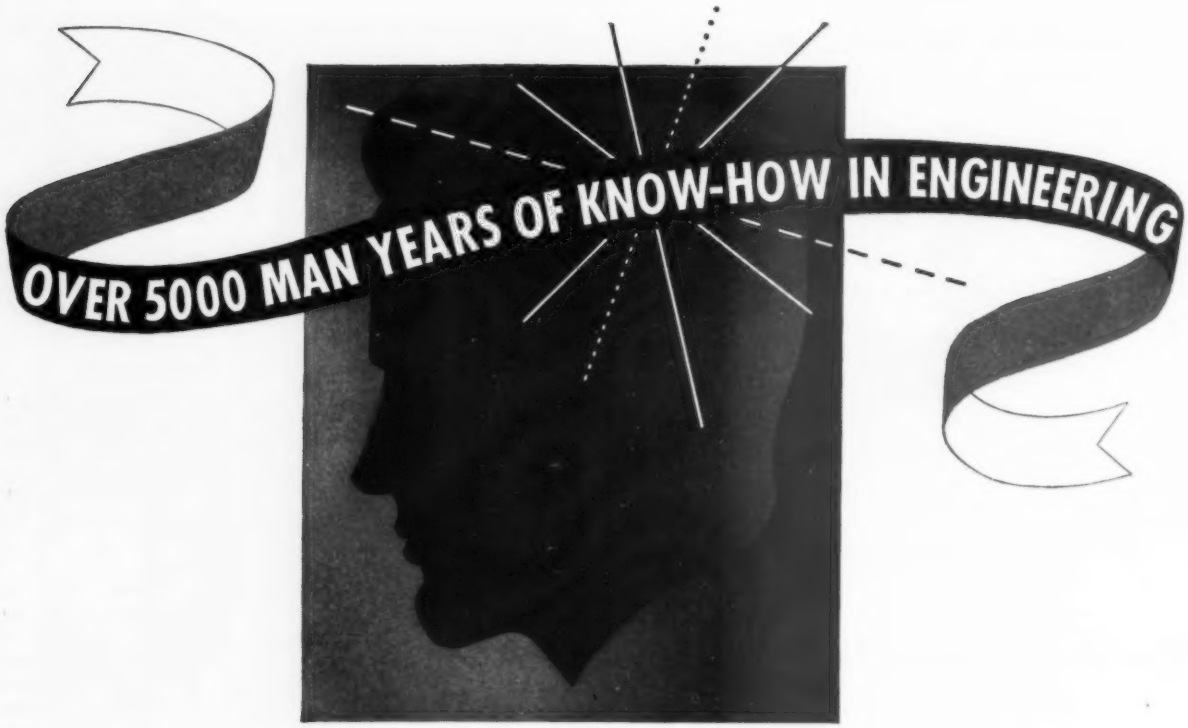
The swing to alternating-current systems has prompted specific developments which further accelerated the trend. At the time the Convair B-36 was designed there was insufficient alternating-current equipment or know-how to permit application of a-c power on any extensive basis. Yet the B-36 was probably an ideal example of the need for this type of system.

The B-36 is a big aircraft. When direct current is routed through a plane of this size the choice of electrical cable is dictated by voltage drop rather than by thermal requirements. This is due to the power loss experienced when transmitting direct current over the distances involved. The net result is a sharp increase in electrical system weight. Weight savings up to 50% are claimed for a 30 KVA system, as contrasted with an equivalent d-c system.

Since the introduction of a-c systems, constant-speed drives (which assure constant frequency for a-c power),



TESTS OF PARALLEL SYSTEM set-up are run in G-E test cell to determine transient and steady-state characteristics of air turbine drive and generators.



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small a-c motors, three-phase inverters which can be tapped for single-phase current, and many other designs have been introduced. Others are immediately ahead.

While some aircraft power requirements, such as heating loads of Nesa glass, prop deicing, communications, and radar, do not require a constant frequency, other applications do. One of the more critical requirements for constant frequency is that of generator paralleling without the complexity or demands of special switching arrangements.

With a-c systems frequency is a by-product of rotational speed. Yet a-c systems must supply power over a range of speed from 3000 to 9000 revolutions per minute. This can be accomplished by supplying the frequency critical loads from a constant-speed inverter which gets its power from the direct current system. But inverters are inefficient and dependence on direct-current systems would hamper long range developments.

These are some of the reasons why development of an efficient constant-speed drive system of alternating current generators is necessary. General Electric, under U. S. Air Force contract and in conjunction with Sundstrand Corp., developed such a unit. Now in use on the Convair B-36 and Martin P5M and meeting increasing acceptance in the country's growing jet engine fleets, the initial constant-speed drive has proved very successful.

General Electric is no longer the prime contractor on this unit, but is marketing a different design of its own. Vickers Inc. also has a constant-speed drive for such applications.

Now that the problem of providing constant-frequency a-c power has been solved, aircraft designers are finding it possible to completely eliminate d-c power generating equipment from the aircraft, as well as the storage battery, which is a piece of equipment peculiar to d-c systems. The relatively minor d-c requirements, such as those for small servo motors, are met by rectifying a-c as necessary. Since the power requirements for starting jet engines, the engine types which power these newer aircraft, are too great for any battery to meet, the elimination of the battery does not aggravate the starting requirements.

Furthermore use of a-c generators has greatly reduced brush problems, which had been a major factor in d-c systems.

These developments do not signal a period of lessened development demands on the power generating equipment manufacturers. Some of the specific problems ahead:

• **Liquid cooling of generators** will probably be necessary to accommodate the higher power requirements and reduced cooling of generators operating at flight speeds above Mach 2. Improved commutator and brush design, grease pack bearings, better insulation, etc., have already been employed to a major degree.

• **Overhang limitations** on the 7″ diameter mount ring of piston engine accessory cases limit maximum generator size and, indirectly, output. The 500 amp d-c generators, such as those in production by Jack & Heintz and in development by Westinghouse, represent the top limit. The 11″ frame of jet pads will permit overhang values to go from 375 inch-pounds maximum to 625 inch-pounds, providing additional power potential.

• **Regardless of mechanical** or horsepower limitations on engine accessory drives, the trend in power sources for meeting electrical requirements lies in the use of auxiliary turbine assemblies of several types. Several major companies have such equipment in production.

• **Electronically trimmed** carbon pile regulators for a-c power systems, designed so that failure of the trimming elements will not affect normal operation, may soon be replaced by one of the magnetic amplifier type regulators such as G.E. has developed under a Bureau of Aeronautics contract and now has in full production. While such regulators may cost up to 50% to 100% more than carbon pile types, they should increase unit life, sharply cut maintenance costs, and can operate with much greater accuracy than carbon pile types.

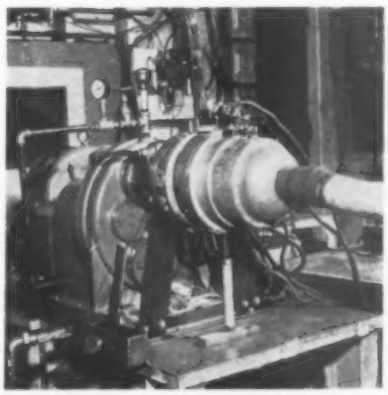
• • •

Dyed Freon Detects Air Conditioner Leaks

A suggestion to use dyed freon in American Airlines' fleet of mobile airplane air conditioners to help trouble-shooting small refrigerant leaks brought a $55 award recently to Washington-based line service foreman Fred Mayer. Previous methods used by AA to detect leaks called for a Halide torch flame test, but this procedure was limited in the case of small leaks, which often could not be found until they progressed to the point where the conditioner was rendered inoperative.

Using a dyed refrigerant the warning of small leakage comes early and can be detected during the course of routine inspection. By preventive maintenance the trouble can be corrected immediately, and the potential of sudden equipment breakdown due to freon leakage is in many instances eliminated.

ALTITUDE CHAMBER receives a pneumatic alternator drive in G-E aircraft systems laboratory.



AIRCRAFT GENERATOR is shown mounted on specially constructed test stand, on which aircraft system prototypes undergo extensive tests before being put into production.

HIGH PERFORMANCE 40 KVA alternators get pre-production test. In the foreground a centralized board regulates air and steam pressure for the tests.

What JACK & HEINTZ *is doing about...*

J&H announces new 1500 va unit with improved regulator for closer voltage and frequency control—adaptable to J&H Inverters now in field.

Jack & Heintz's new F137 Inverter (Motor-Generator) is the first in its volt-ampere rating to complete Air Force altitude cycling tests for 50,000-foot operation and has now been released for production by the Air Materiel Command.

Featuring an improved speed and voltage control, the F137, a 115-volt, 400-cycle, single-phase rotary inverter, delivers 1500 va output at 50,000 feet and at +20° C ambient temperature.

Improved electrical insulation, redesigned commutator and brush arrangements, new housing configuration for better air flow, and the new FRS speed and voltage regulator assembly represent major advances in high altitude inverter performance.

J&H looks to the Future

The F147, capable of 2500 va at 50,000 feet, at +20° C ambient temperature, has completed cycling tests at Jack & Heintz laboratories. We are also pioneering the design of an environmental-free 2500 va inverter for still higher altitudes and ambient temperatures, in accordance with an Air Force development contract.

Our engineers will be glad to work with you in developing inverters or other *Rotomotive* equipment to meet your specialized needs. Write Jack & Heintz, Inc., 17633 Broadway, Cleveland 1, Ohio.

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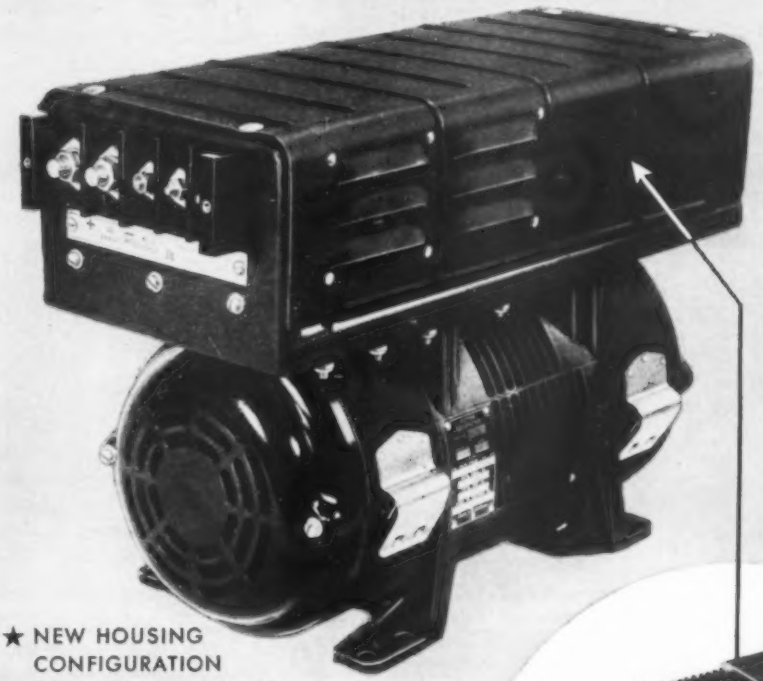
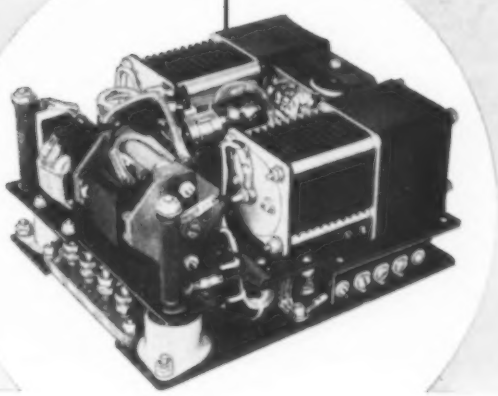


★ REDESIGNED COMMUTATOR AND BRUSH ARRANGEMENTS

★ IMPROVED ELECTRICAL INSULATION

★ NEW HOUSING CONFIGURATION FOR BETTER AIR FLOW



NEW FRS SPEED AND VOLTAGE REGULATOR FOR F137 INVERTER. PROVIDES INSTANTANEOUS OPERATION WITH NO WARM-UP PERIOD, VOLTAGE REGULATION CLOSER THAN PLUS OR MINUS 5% AND FREQUENCY REGULATION CLOSER THAN PLUS OR MINUS 2.5%

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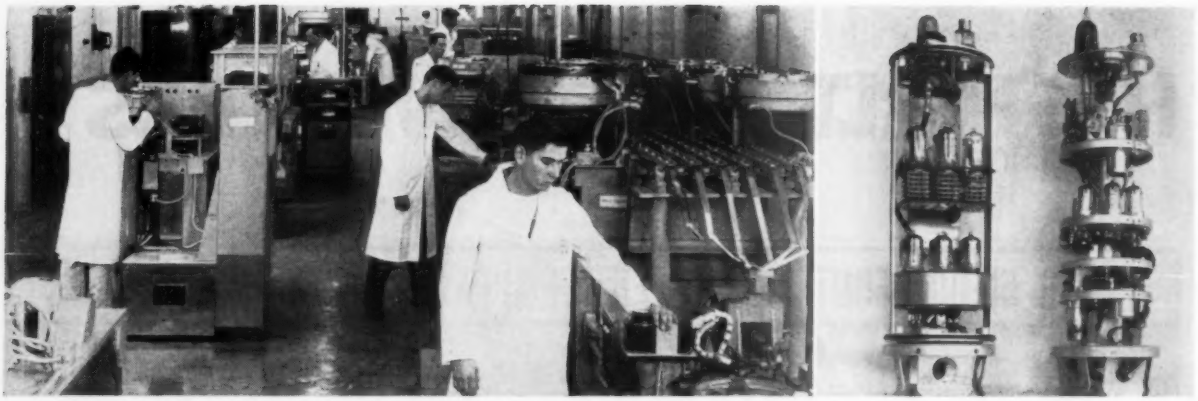


PILOT PRODUCTION using modular design is shown here in plant operated by Kaiser Electronics Division of Willys Motors, Inc. At right, MPE manufactured assembly is compared with conventional unit.

Report on Tinkertoy Production Techniques

Sweeping cuts in manufacturing and assembly time seen result of Navy-Bureau of Standards project.

WITH the real future of the electronics industry long viewed by experts as one closely keyed to its adaptability to automatic means of production, the path was cleared last month for the first big step in this direction. The Navy Bureau of Aeronautics and National Bureau of Standards took the secrecy wraps off "Project Tinkertoy" (AMERICAN AVIATION, Sept. 28).

A $5 million program developed by NBS with Navy funds, Tinkertoy comprises both a new design for the manufacture of electronics components called the Modular Design for Electronics (MDE) and an automatic method of producing equipment using this design, called Mechanized Production of Electronics (MPE).

Although the immediate reaction of top executives of the electronic industry during the first showing of the new manufacturing concept was said to run the gamut from keen interest to no comment, the Navy is now gearing its facilities to make blueprints on the project available to manufacturers qualifying for their use, either by reason of their size or the extent of their military production.

The timetable for the release of this information calls for distribution of data late this month on hand tooling which will permit the early use of the module concept without awaiting plant mechanization. This will be followed in about six to eight weeks by availability of plans and technical data on the complete mechanized facility, when some sort of selective distribution, yet to be finally decided, will be made.

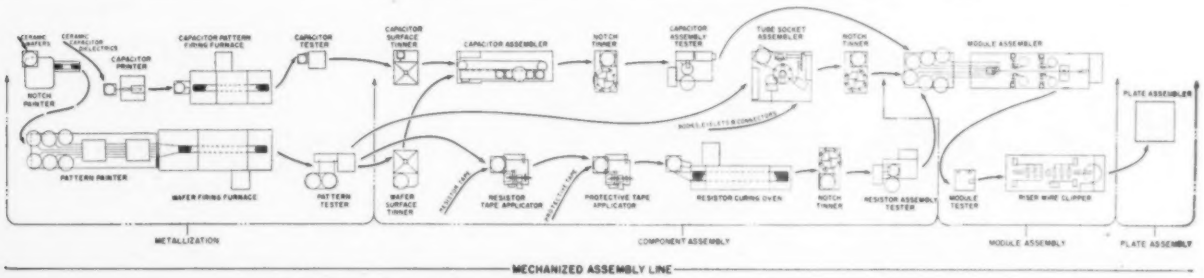
But since its first showing to top industry representativese, the interest in Tinkertoy has snowballed. According to Navy officials its displa yat the recent National Electronics Conference in Chicago stole the show, and more exhibitions of this type are planned. The flood of requests to inspect the pilot plant at Arlington, Va. has necessitated allocation of one day a week just to accommodate visitors.

At this writing some thirty electronics firms have made specific requests of the Navy for detailed information, including such major producers for a· iation as Westinghouse and the Hughes Aircraft Co. Westinghouse interest is said to have progressed to the point where cost data is being sought on the automatic electronic testers used throughout the assembly line.

Until the acceptance of MPE becomes a reality and the needed equipment is procured and placed into use, the sole production will continue in a pilot plant operated by the Kaiser Electronics Division of Willys Motors, Inc., at Arlington, Va.

The Kaiser facility, which will serve as the prototype of any future installations adopted by industry, carries the manufacturing process from the raw materials through to the completed electronic stage, less the electron tube. Only the final touches, such as a means of fixing the module to a base plate containing a printed circuit, are now required to make the mechanization of the process complete.

First step in the MPE process is the formation of the basic wafers, capacitors, and resistors before their auto-



FLOW CHART OF PILOT PLANT traces path of components from metallizing stage to final assembly. Ceramics facility is not shown.

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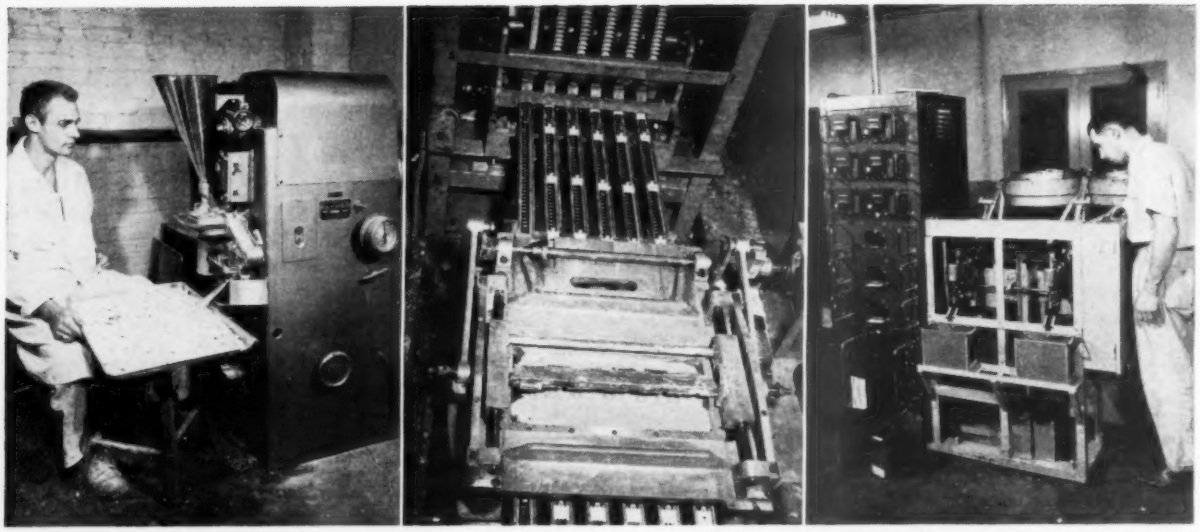


DOUGHNUT-TYPE PRESS (photo at left) turns out 2800 wafers an hour. Machine (center) automatically applies predetermined silver-paint circuits to wafers. At right, circuits get 100% tests.

matic assembly and testing. Special presses designed for the project by the Doughnut Corp. of American turn out 2800 of the ⅞″ square ceramic wafers, made from a controlled mixture of talc, kaolin, and barium carbonate. After mixing, filtering, and drying into a flour, an added refining process is applied and the mixture is loaded into a press feed for stamping under pressure into the wafer shape.

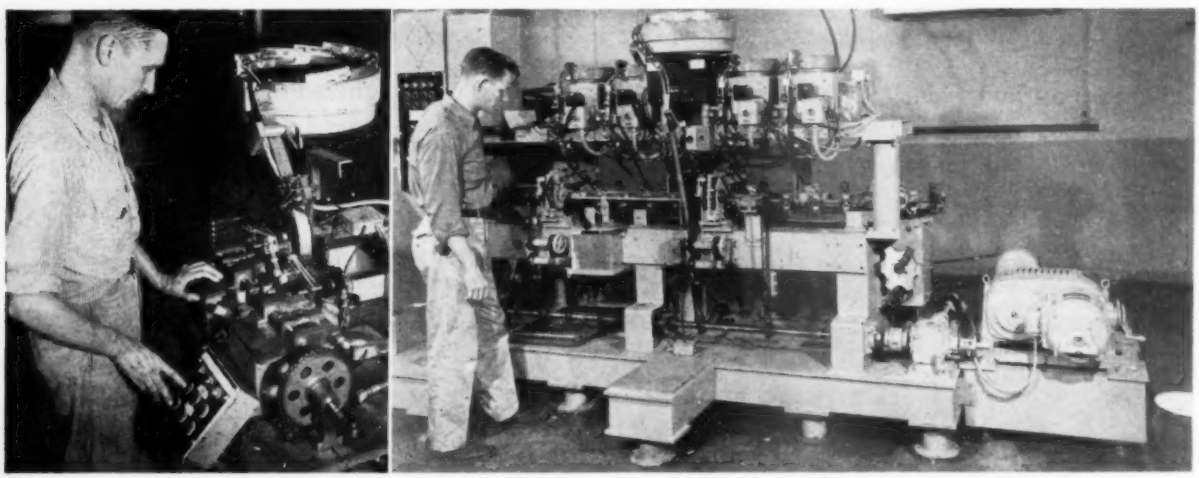
The stamped wafer is now complete with standard spacing of side slots for later addition of wires to form the module and a pilot slot to permit selection and arrangement by mechanical means. Each wafer is then passed through a tunnel kiln operating at 2300° F. Here the ceramic is cured in nine hours, after which the completed product is mechanically gauged for proper dimension.

Using almost identical processes, titanate capacitor bodies are manufactured of nonporous ceramic composed of magnesium, barium, and strontium titanates of high purity. The finished capacitor measures ½″ square by 1/50″ thick, with values varying from 7.0 micromicrofarads to 0.01 microfarad. Experience in the Willys-operated facility has shown that a raw material batch weighing about five pounds will produce nearly 100,000 capacitors, of which roughly 80% will be acceptable.

A third common component of the MPE system, tape resistors, are produced from a heat-resistant asbestos paper tape called Quinterra, polyethylene tape, carbon black or graphite, resin and solvent. The ingredients of the resistor, which include carbon, resin and solvent, are ground to a fine adhesive powder and then sprayed on the Quinterra tape followed by a protective coating of polyethylene tape applied over the compound.

The tape is then slit into narrow bands and stored in a refrigerator until used. A 75 foot roll of tape will produce over 10,000 resistors and the range can be varied from 10 ohms to 10 megohms. Tests have shown resistors produced by this method hold their rated resistance within plus or minus 10% up to temperatures near 400° F. and to be capable of ¼-watt power dissipation at operating temperatures.

In the MPE process the bare ceramic wafer is first taken to an automatic dip soldering device which tins the side slots in preparation for sub-



MACHINE SHOWN HERE (left) automatically cuts half-inch segments from resistor roll and presses between silver electrodes on wafer. At right, capacitors are oriented, assembled and bonded to wafers.

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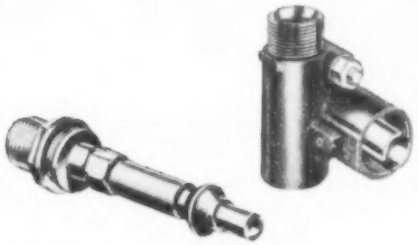

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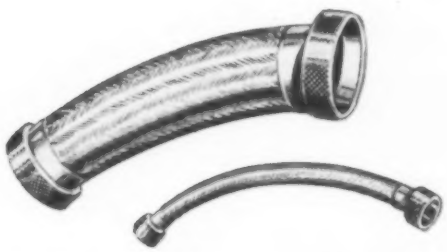

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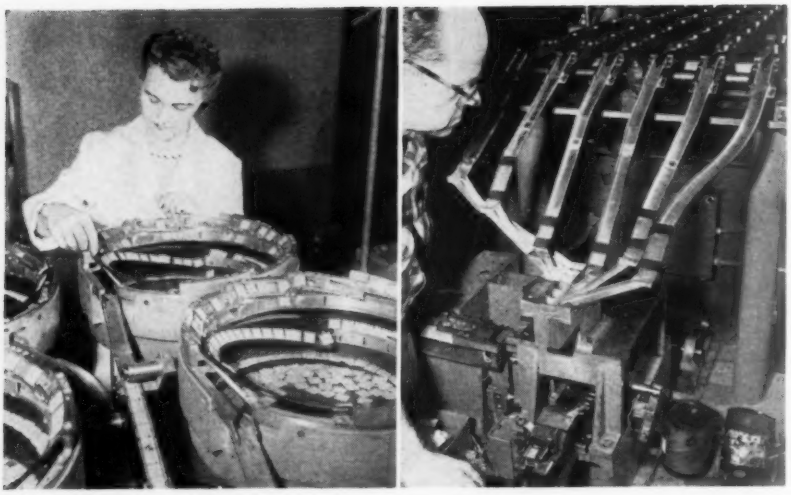
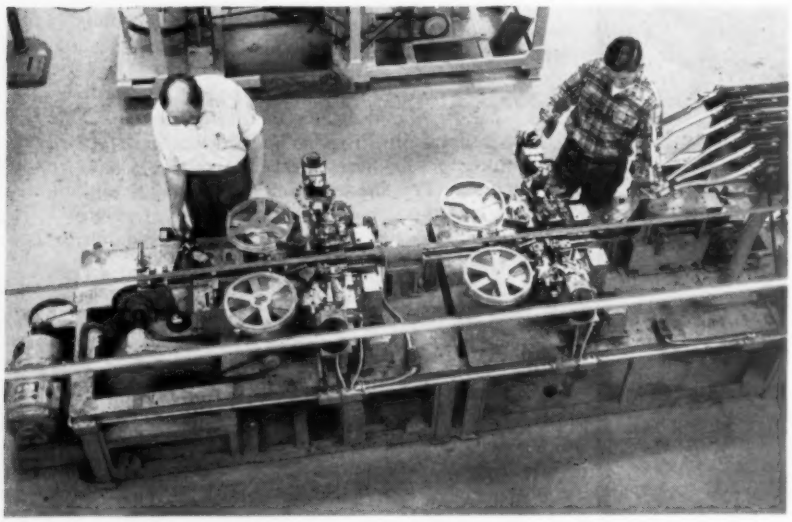
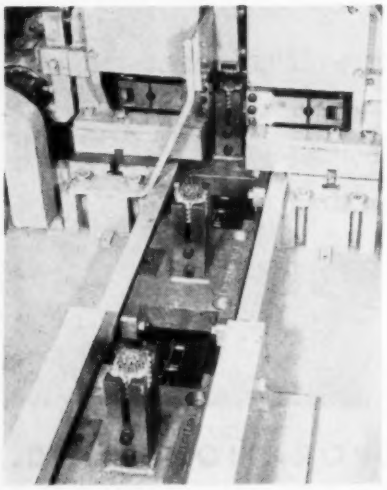


FINISHED WAFERS, with parts mounted, are loaded in vibrating bowl (left) which feeds single, oriented units into stacking jig. At right, channels feed up to six wafers to automatic soldering device which bonds riser wires to wafer notches.





TOP VIEW OF MODULE ASSEMBLER shows two stations where wires are automatically soldered to wafers. Units are rotated 90° between stations with six riser wires applied at each location.

CIRCUITS ARE CLIPPED by automatic device according to predetermined plan. Some riser wires not used in circuit merely support module.

sequent circuit attachment. Another machine metallizes a silver-paint circuit from one side notch to another, or across the face of the wafer in anticipation of the ultimate attachment of a capacitor or resistor.

Other devices apply the conducting surfaces and leads to capacitors, cure the bodies in a furnace, and inspect the final circuits. Electronic testing devices designed by Communication Measurements Laboratory, Inc. of Plainfield, N. J., not only automatically check each finished wafer, but include a self-checking circuit continually to assure its own accuracy between wafer checks.

Joining Completed

With the wafers and components produced and metallized, automatic equipment completes the joining processes. Machines apply as many as two capacitors or two resistors (but not a mixture of both) to one or both sides of a wafer. One machine, used to install resistors, mounts a roll of resistor tape, automatically cuts it into ½″ strips, presses the tape between printed electrodes on the wafer, applies pressure, and then ejects the completed piece.

Final assembly of the wafers into a module or building block is mechanized. Six feeders carry the wafers to a slotted loading device that mounts them in an upright position between special jaws. Next a chain drive carries the jig to a soldering position where six wires are guided into notches in the sides of the wafer (three on each side). The mechanism brings soldering irons into contact with the wiring and pretinned notches, bonding the wiring to the wafer.

In subsequent operations the same machine moves the module to its next station after rotating it 90° where the complete procedure is repeated and six more wires added to the remaining sides. In the final assembly, the riser wires are clipped automatically according to the circuit requirements, and the completed module tested. • • •

Revised Part 40 Date Postponed to January

The effective date of revised Part 40 of Civil Air Regulations which governs the certification and operation of domestic scheduled airlines has been postponed by the Civil Aeronautics Board until January 1, 1954. Need for extension beyond the October 1 date previously set, according to CAB, resulted from unforeseen delays in the publication of manual material and issuance of operations specifications sufficiently in advance to enable orderly implementation of the new rule.

CABIN COMFORT

To give passengers cool comfort in hot summer weather, forward-looking airlines are modernizing their cabin pressurization and air conditioning equipment by installing Stratos high capacity cabin superchargers and refrigeration units.

Capable of handling the requirements of high density aircraft, Stratos units are replacing older equipment in Constellations and Convairs and have been ordered in quantity by the Air Force.

Stratos superchargers and air cycle units assure the airline operator the most for his air conditioning dollar. They have established outstanding service records. The highly efficient Model B-60 Bootstrap cooling unit illustrated below, for example, has a specified overhaul period of 2500 hours.

MODEL B60 REFRIGERATION UNIT

Axial flow turbine • Rated Flow 62 lbs/min. • Discharge temperature, approximately 0°F. on 100° day

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"Plug-in, plug-out" simplicity in Avien's "TWO-UNIT" FUEL GAGE

This "repackaging" of Avien's capacitance-type fuel gage is 50% lighter and needs no field adjusting.

Up until now, most fuel gaging systems needed four units: a tank unit, an indicator, a bridge-amplifier and a shockmount.

No field calibration was required for the Avien tank unit or indicator. Avien held them to such close tolerances, the adjustments for individual installations were actually "built-in."

The bridge-amplifier (the "black box") was a different story. This intermediate unit was supplied as a common part, for universal application. And that's where field calibration *had* to be made.

There was only one answer, as far as Avien was concerned. The "black box" had to go.

Now, in the Avien Two-Unit system, the necessary components for the bridge and amplifier functions have been built into the indicator case. The "black box" is eliminated, and so are many parts which were necessary to make the "black box" universally applicable.

The Two-Unit Gage gets installation down to "plug-in, plug-out" simplicity. No more field calibration is necessary — and that means that all units designed for the same aircraft are interchangeable. Avien units are now all "shelf items."

To install the Two-Unit Gage, you *don't* need trained personnel, you *don't* need specialized equipment, and you *don't* need calibration instruction or data.

This new "package" brings savings all along the line. The basic system is reduced in weight by 50%. Installation time is cut. Less wiring and connectors are needed. Less maintenance is required. Trouble-shooting becomes easier. And fewer parts must be stocked for maintenance and repair.

As in the previous system, additional functions for fuel management can be integrated into the basic gage — and with less complexity than ever.

The Avien Two-Unit Gage is now available to meet your manufacturing schedules. The indicator is available in either large or small sizes, with all varieties of dial configurations.

Every month, Avien produces over ten thousand major instrument components for the aviation industry.

We believe that Avien's Two-Unit Gage will contribute to the obsolescence of many earlier systems, including our own. For further information, write or call us.

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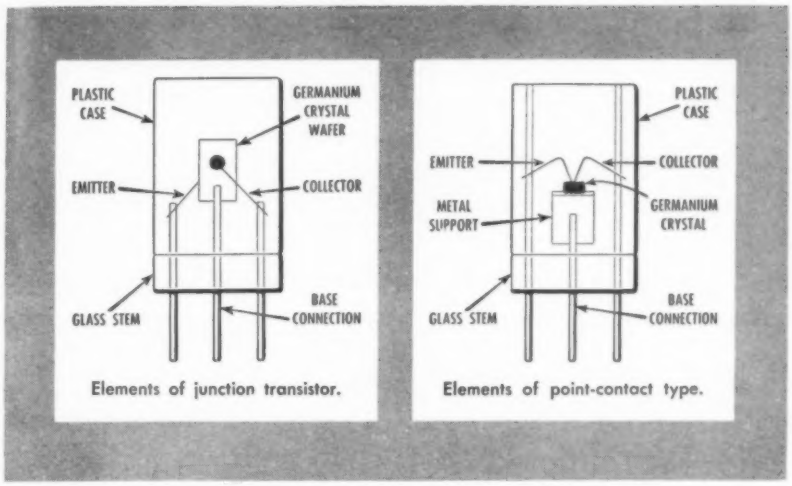


PRINCIPAL PARTS of the two main types of transistors—the junction and the point-contact type—are shown above.

New Advances Mark Transistor Growth

Aircraft applications should cut size and weight; manufacturers announce developments.

By Charles Holm
U. S. Navy

The author's opinions are his own, and do not necessarily reflect those of the Navy Department.

SINCE the transistor emerged from the Bell Telephone laboratories in 1948 as first cousin to the crystals that used to form the heart of primitive crystal sets, the electronics industry has been designing around it almost every kind of audio amplifying device, as well as other types of circuit.

Virtually every major electronic equipment manufacturer has designs on the drawing board to take advantage of the transistor's unique capabilities. Recent developments in the field have now set the industry to vibrating faster than ever:

• **A four-element transistor** similar to a tetrode type electron tube has been announced by Sylvania Electronic Products; the new type has the amplification capabilities of two simple transistors;

• **A pentode type transistor** is being perfected, according to the same manufacturer, and will soon be ready to replace three-element transistors for some applications;

• **A new transistor** has been successfully operated as an oscillator at radio frequencies as high as 300 megacycles per second, according to the Radio Corporation of America, which also claims that regular operations at frequencies as high as 160 megacycles per second are indicated.

• **Amplifications** as high as 40-50 decibels have been announced.

The germanium crystal permits the flow of current in one direction and inhibits it in the other. When a piece of crystal about the size of the head of a pin is connected to two or three leads and encased in a protective plastic covering, a transistor results. The transistor is on the order of 1/400 the size of an electron tube.

Besides its small size the transistor has an array of other characteristics calculated to appeal to equipment designers:

• **It consumes** roughly 1/400 the power of a comparable electron tube (approximately two to five milliamperes);

• **It is rugged,** thanks to the solid block of plastic in which it is imbeded;

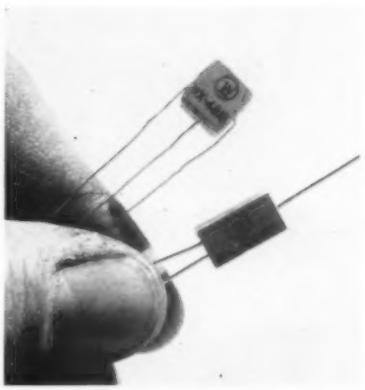
• **It requires** no warm-up period;

• **It is waterproof;**

• **It can be expected** to have long operating life, as indicated by laboratory tests;

• **It involves** fewer components when replacing a tube circuit;

• **It can,** in some of its forms, serve as a photocell.



SIZE of typical transistors is shown in photo above.

The implications of all this for aviation are great, even now while the transistor is still in its infancy. Applications in airborne communications, radar, and navigational aid equipment come to mind immediately. Reductions in size and weight of equipment will be considerable, and should prove to be particularly important in military aircraft, where the number of extremely complex units comprises a surprising percentage of the load.

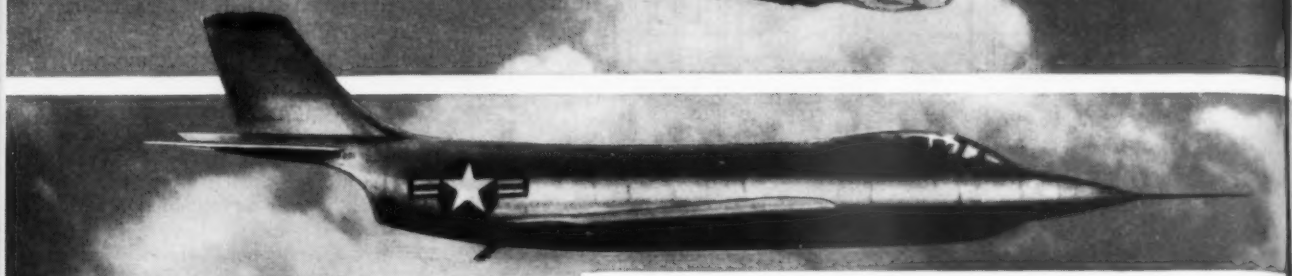
Maintenance headaches should drop off greatly from present levels as electron tube failures are eliminated; today such failures account for as much as 75% to 85% of electronic equipment trouble. The small size and weight of individual units will lead to wider use of sub-assembly and plug-in construction techniques. The low power required will materially lessen power supply space and weight, as well as the present high battery drain of electronic equipment.

With limiting frequencies as high as 100-150 megacycles indicated in the newer types, use of transistors in most aircraft electronic equipment is certain —not only in audio circuits but also in intermediate frequency amplifier circuits such as are found in VOR and DME communications equipment, and ILS and beacon receivers. New developments also indicate future use in the signal frequency circuits of such equipment.

Although the transistor itself is a quite recent development, the concept of controlling electron current flow with semi-conducting materials is not new. Even before the turn of the last century it had been demonstrated that certain materials had a high resistance to electric current flow in one direction, but a low resistance in the other direction.

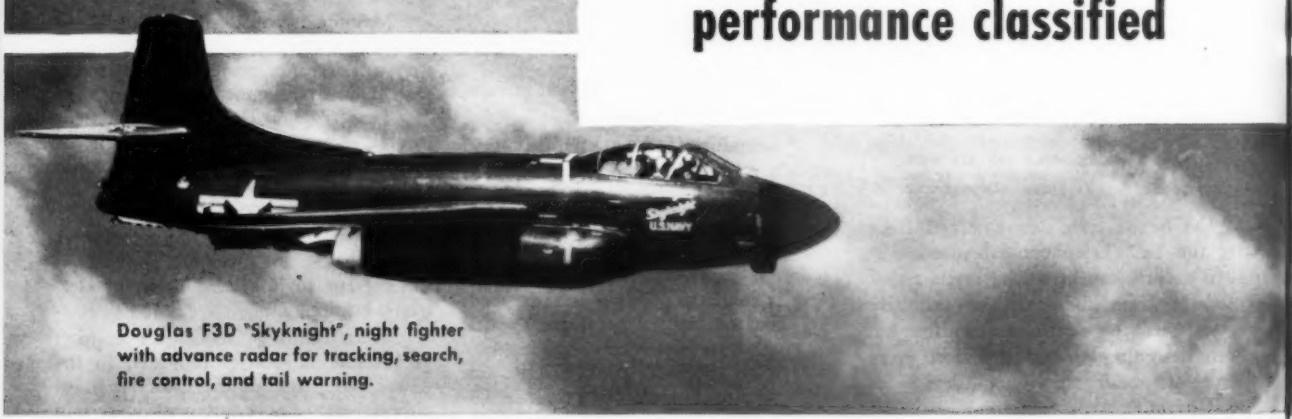
In the early part of this century the crystal detector was widely used in radio receiving applications. The "cat whiskers" type detector was familiar to all home radio experimenters and set builders in the Twenties. This type of semi-conductor was used only as a detector, to convert radio frequency energy

Chance Vought F7U-3 "Cutlass", swept wing tailless fighter with twin turbojets.



McDonnell F3H "Demon", single engine carrier based fighter.

Powered by Westinghouse... performance classified



Douglas F3D "Skyknight", night fighter with advance radar for tracking, search, fire control, and tail warning.

McDonnell F2H-2 "Banshee", twin-jet carrier based fighter.

Convair XF2Y "Sea Dart", twin-jet water based fighter.

Most everything can be said about these U. S. Navy aircraft except how fast, how high and how far their Westinghouse turbojet propulsion will push them.

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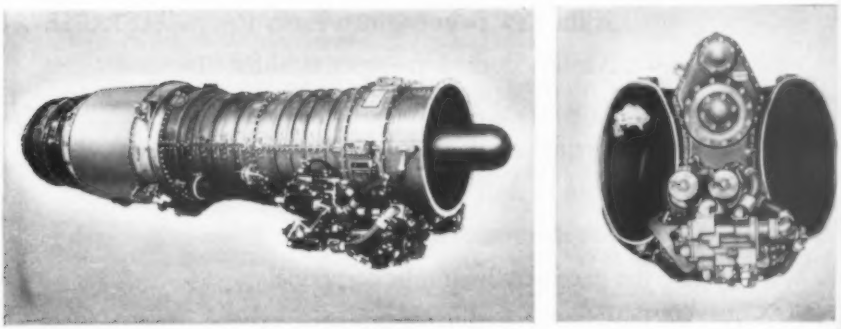
These Westinghouse contributions come from the long experience, productive skill, and facilities of the Aviation Gas Turbine Division. A long-range program concentrates on advancing jet engine performance to highest possible levels for qualifying America's air arm to outfly, outfight and out-perform wherever and whenever needed. Westinghouse Electric Corporation, Aviation Gas Turbine Division, Lester Branch P. O., Philadelphia 13, Pennsylvania. J-54028-A



Side view of Westinghouse J34 turbojet and front view of J40 turbojet, showing the singular Westinghouse feature of small diameter and reduced frontal area.

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into pulsating direct current or audio frequencies.

After DeForest's development of the control grid in the vacuum tube, emphasis on the semi-conductors diminished. In the Thirties and early Forties manufacturers raced to design and produce dozens of types of multi-purpose electron tubes. Many special types of tubes, such as the pentagrid, the beam-power pentode, and numerous multi-element and multi-purpose tubes were developed.

With the tremendous emphasis placed on electronic devices during World War II, and the resulting acceleration of electronic design and development, many new requirements were placed in the hands of electronic design engineers. Electron tubes were found incapable of, or limited in, operation in certain types of circuits, and the crystal diode was used in many applications.

Crystal diodes were widely used in radar circuitry where tubes were limited by the extremely high radio frequencies used, and because of the simplicity of the crystal diode. In most cases the diodes were used for radio frequency detection, the necessary amplification being achieved in lower frequency tube amplifier circuits. Today crystal detection is widely used in radio and radar circuits, as well as home television and radio receivers.

Before the transistor was announced by Bell in 1948 much study in the nature of germanium and other semi-conducting materials had been done. This first transistor had in effect two "cat whiskers." This modification expanded the capabilities of semi-conductor devices from rectification and detection to the vitally important function of amplifying signals.

Many manufacturers had for years been conducting experiments and research in the electronic properties of solids and semi-conductors. Some of this work dealt with materials which gave off light when bombarded with electrons, such as cathode-ray tube coatings. Other work concerned those materials which gave up electrons when light was directed upon them, such as the primary types of photoelectric cells.

Manufacture of transistors is a complicated process. Although many materials have semi-conductor properties, transistors are made primarily from germanium. Pure germanium is grayish-white in color, is of the same group of metals as tin and lead, is easily fuzable, and very brittle. It is named after the country of the German scientist Winkler, who first discovered it in 1886.

The solid crystal of germanium,

which is the heart of the transistor, is not found in nature, and must be prepared for use. Nearly every metal bears a trace of germanium, the chief ores being germanite, a sulphide of copper, iron, zinc, and lead, and argyrodite, a silver sulphide. The chief U. S. source is the dust in the stacks of zinc smelting plants. Certain types of coal ash also contain a high germanium content.

In a pure atom of germanium, the four outer valence electrons are locked tight to the adjacent atoms and they cannot move about in order to carry a current (at normal temperatures).

In "N-type" germanium the element is treated with a material whose atoms are capable of giving up electrons which are then usable within the crystal, not needed for binding purposes, and free to move about and carry a current.

In "P-type" germanium the element is treated with traces of atoms capable of borrowing electrons, and again the crystal becomes capable of current conduction. However, lacking electrons, the crystal structure is left with a hole. These holes behave like positive charges, and "flow" in an opposite direction from electrons.

Broadly speaking, transistors are made in two types, or families of types: point contact and junction.

A point-contact transistor is built with two "cat whiskers" spaced about 0.05″ apart, touching a very small block of germanium crystal. This type has particular application as a very fast switch for electronic computers and as a control device for certain TV and FM radio circuits.

The junction transistor is built from a minute ply of the two kinds of germanium crystal. This tiny ply of germanium crystals is usually made of three layers arranged N-P-N or P-N-P. It can be fabricated by introducing the alternate kinds of impurities as the crystal is grown, or by fuzing tiny spots of N-type material to both sides of a tiny piece of P-type material (or vice versa).

Ordinarily, dots of P-type germanium are held by a mould on each side of an N-type wafer and heated in a special furnace. By controlling time and temperature the exact degree of fuzing can be reached, with the outside P-dots separated by no more than one thousandth of an inch.

The alloyed crystal is mounted on a glass stem and the completed assembly is coated with an opaque plastic.

Junction transistors are much more stable as amplifiers and are capable of gains of 40 db or more, as compared

with 20 db for the point-contact type. Furthermore, because of less uncontrollable electron activity within the crystal, they are much less noisy, another distinct advantage for amplifying applications.

It is a foregone conclusion that widespread use of transistors will shortly be made, as costs decrease and operational characteristics improve. In their present stage of development, however, transistors present certain problems:

- **They are susceptible** to overheating;
- **Although frequency limits** are constantly being raised, transistors will not yet replace tubes as amplifiers at the higher operating frequencies;
- **Amplification factors** are steadily rising, but do not yet approach those of high-gain tubes;
- **Transistors** presently are low-power devices;
- **New circuits** must be engineered around them.
- **Transistors are expensive.** Present costs vary considerably, from six dollars up, in small lots, as opposed to a dollar or less for a comparable electron tube. Constantly increasing production and demand will reduce cost greatly.

Extensive development of circuit applications and the investigation of new manufacturing techniques, together with increasing demand, should overcome these disadvantages.

Transistorizing present equipment is now under consideration by most manufacturers. A transistor, of course, will not directly replace an electron tube, as circuits must be modified. However at the accelerated rate of development and application, new equipment, partly or completely transistorized, can be expected within two years.

• • •

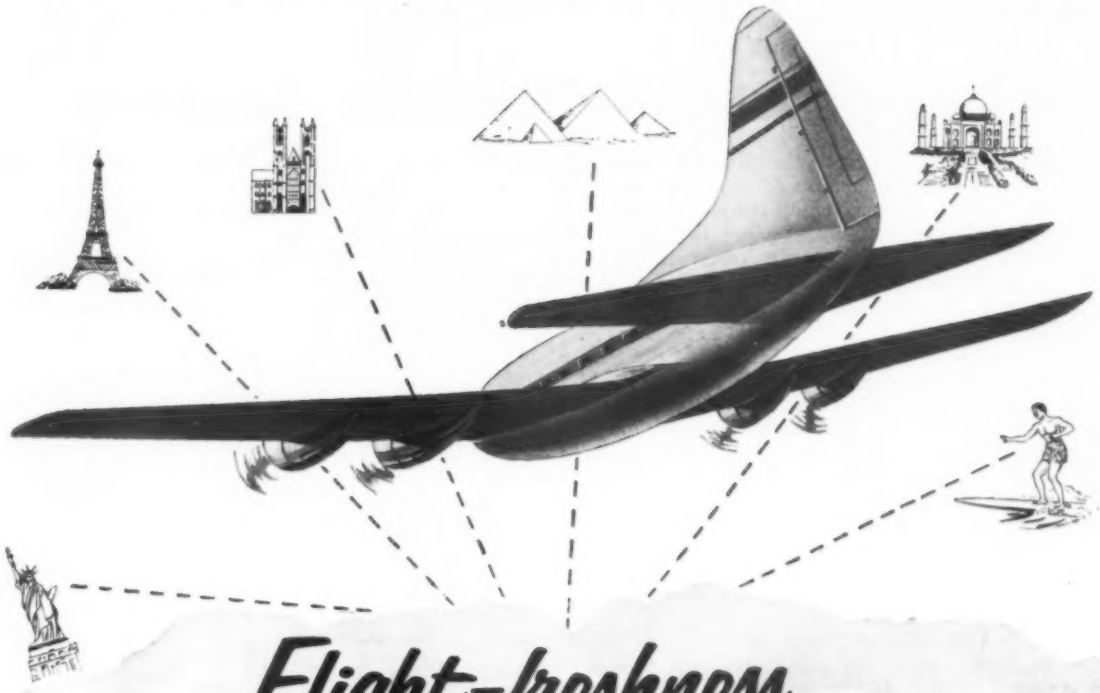
Canadian Helicopter to Be Produced in U. S.

The Canamerican Helicopter Mfgr. Co. Ltd., Montreal and Brooklyn, is planning production of the SG Mark IV helicopter, following purchase of design rights from Inter-City Airlines of Montreal.

Designated to negotiate manufacturing rights in the U.S. is the S&S Machinery Co. of Brooklyn, N. Y. An official of the latter company stated that S&S facilities in Portland, Me., would probably be used for airframe and component production, with rotor and engines being subcontracted.

The Canamerican SG VI is a three-place, single-rotor helicopter powered by a Franklin SA4-200-06 six-cylinder, air-cooled engine.

PASSENGER COMFORT ASSURES REPEAT TRAFFIC



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A MILITARY COMMENTARY . . .

The Navy's Role in Strategic Bombing

SIX YEARS after unification the Air Force and the Navy still have no agreement on which service will atom-bomb what targets in the event of war. Air Secretary Harold E. Talbott spilled the fact onto the public record during a press conference called Sept. 28 to announce expansion of aircraft orders.

Talbott's disclosure brought out into the open a problem that had plagued retired Gen. Omar N. Bradley throughout his terms as chairman of the Joint Chiefs of Staff. Army sources close to Bradley said Air Force Gen. Curtis LeMay, who runs the Strategic Air Command, long had sought to learn what target systems the Navy could take over with its carrier-based attack bombers. But the Navy took the somewhat coy position that it could not commit itself—like the girl who won't say if she'll go out with the guy, or not. However, the Navy recently has begun to receive aircraft with adequate range to reach targets 800 miles from carrier decks, according to Army sources familiar with Joint Chiefs problems.

Talbott's disclosure, apparently inadvertent,—came in the middle of the news conference. This reporter fired at the Air Secretary a question as to whether there is any agreement on assignment of war targets to the Air Force and Navy.

"No," Talbott answered. "No policy?" this reporter persisted. "No," the Air Secretary said again. He hastily added that such would be "security information, anyhow."

As it seemed passing strange that no firm policy of target assignments had been made, even six years after unification, this reporter concluded that a little inquiry on the topic would be in order. So he called on a Navy spokesman for information. Perhaps this information will clarify the situation to some extent. But there's still no joint Air Force-Navy policy as to assignment of war targets. That's the only certainty, after six years of "unification."

The Navy, to put it in a nutshell, seems to be in the position of the Irishman who must be prepared to mount his horse and ride off rapidly in all directions. It can't afford to be tied down to any target system in advance of actual war. It must be prepared to attack targets that need attacking at that time. It doesn't want to be placed in a position where it may be ordered to abandon operations in some critical battle area to send off its precious carrier-based attack bombers to plaster Leningrad—possibly at the nudging of the SAC commander, whose responsibility is the mission of strategic bombing. The Navy has no such mission. It has other important missions which will require all its energies and attentions. It doesn't want to duplicate the Air Force mission, according to the spokesman.

Words frequently get so worn they lose meaning. Democracy is one; strategic is another. Webster says strategy is "the science and art of military command, exercised to meet the enemy in combat under advantageous conditions." Thus, strategy is direction, usually exercised in advance of conflict, and then throughout the war.

Tactics, says Webster, is "the science and art of disposing and maneuvering troops or ships in action or in the presence of the enemy, so as to use in action the resulting disposition." Thus, while strategy is direction before action, tactics is use in action.

Putting it another way, the Air Force, by reason of its mission, must use its Strategic Air Command strategically to perform a certain pre-determined job in war. The Navy, on the other hand, by the nature of its mission, must perforce use its aircraft tactically.

Thus SAC knows—or presumably should know—long in advance of war just where it is going to send its bombers to destroy pre-determined target systems, which may remain constant targets until destroyed; or it may switch to other target systems, at present undetermined. The Navy, on the other hand, must carry out its mission—to win and maintain control of the seas. Its aircraft—and its warships, for that matter—are only units in a vast weapons system designed for the express purpose of maintaining control of the seas and denying use of the seas to any enemy nation or nations.

No Single Weapon Wins

Why is this control of the seas so vitally necessary to the United States in this air-atomic age when our inter-continental bombers presumably—and that's an indefinite assumption—can fly to the heart of an enemy nation and blow his industrial, transportational, and political systems to smithereens?

History provides one answer: down through the centuries no single weapon ever has won a war alone and unaided by many other weapons. For that matter, two inter-continental counter-bombardment forces of equal destructive power, employed with equal skill, presumably would accomplish equal destruction and thus cancel each other out. When the last bomber had been destroyed, the last city desolated, the war then would proceed to its conclusion by other means—possibly clubs and ships.

The other answer of history is that no land power, although aided by an inferior navy, ever has succeeded in defeating a sea power, even though that power was weaker in land forces.

Napoleon tried to destroy English sea power by capturing and consolidating all of Europe and Western Asia into one great empire. Both the Kaiser and Hitler tried the same thing. But although all won many battles at the start—including appalling submarine destruction of shipping—in both world wars, none of them ever succeeded in defeating the sea powers that opposed them.

In each war cited above, control of the sea was the decisive factor. The side which controlled the seas had access to the material and human resources of the rest of the civilized world. By mobilizing these worldwide resources and by convoying them across the sea to points where they could be brought to bear against the continental—or island—enemy, the sea powers have repeatedly succeeded in defeating their continental adversaries.

For that matter Russia during much of World

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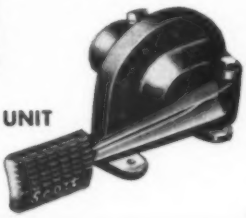

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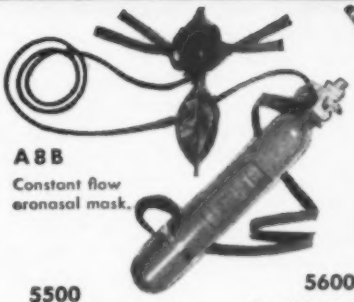

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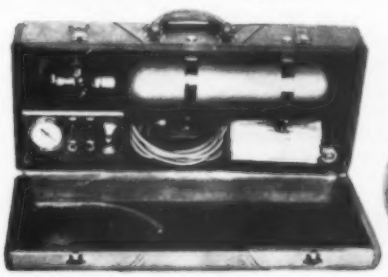

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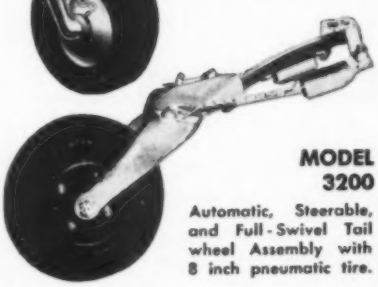

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"... Naval strategy must be flexible"

War II had the aid of American sea power, and thus received weapons, ammunition, bombs and food and medical supplies. In the next war, if it is between the U. S. and the U. S. S. R., the Communists will have the help only of land-locked satellite nations—including possibly a blockaded China. The Russians will get as much military aid from those satellites as the Nazis got from the Italians under Mussolini.

Now if the Navy's mission is to achieve and maintain control of the seas, and if the Air Force's mission is to defend the nation in the air and to deploy enough airpower to defeat the enemy air forces and destroy the war-making potential of the enemy, why should there be any rivalry between Air Force and Navy? Yet there is rivalry between them on this matter of land-based as against ship-based airpower.

Fight for Prestige

The consensus seems to be that the battle of the budget is the chief reason for this rivalry, this deep-seated suspicion, this belittling of one service by the other. Why think the Air Force can destroy the widespread industry of Russia with B-36's, or B anything else? the Navy asks. The Navy says fixed air bases can more easily be destroyed than carriers, which are protected by their fighters and anti-aircraft weapons. The Air Force says the carriers can be sunk by bombers. So it goes. Why?

The answer seems to be that that there is only so much money available for defense. It must be divided somehow between all three of our armed forces, land, sea, and air. If we build so many carriers—and their planes—we can't build so many bomber wings. The squabble is right here in the Pentagon and on Capitol Hill, not in the field. It's a fight for funds, for position, for prestige. And that's all it is.

Here's the Navy's position, and why it doesn't want itself committed to any target system: that would shackle it in its attempts to carry out its mission of controlling the seas. The United States plans no aggression, will start no war. It has forces deployed, as in Europe and Africa, to resist aggression. But in war it will not have the initiative, will not be able to choose the point of initial conflict. That is up to the enemy; he will choose the place of attack, will have assembled forces at that point or points.

The Navy's job, then, will be to bring American force to those points of attack, to herd safely across the seas the millions of tons of war material and supplies required by land and air forces. These things cannot go by air. That was proved again in Korea. They must go in ships—only the highest priority cargo can be airlifted. There are not enough transport airplanes in all the world to supply the needs of ground and air forces operating overseas in a world-wide war.

The Navy's task is one of staggering proportions. The Russians are said to have over 350 submarines of standard schnorkel types and the Walther true submarine type. They are more of a menace than the German submarines of World Wars I and II. The Russians also have land based bombers, better equipped than World War II types to sink shipping. That—and a chiefly cruiser navy now building, evidently for raider purposes—gives the Navy quite enough to handle without trying to take on part of the Air Force job of strategic bombardment.

It should be emphasized that if the Navy fails in its job, no American fighters or bombers long will be flying from European and African bases. They'll be out of gas, out of bombs, out of supplies. They'll be units in a grounded Air Force. The Army soon would be out of ammunition, food, and all other supplies.

If our Navy loses control of the seas, the Russian undersea navy and land based airpower will defeat American land and air forces based overseas, without ever firing a shot at them. Furthermore, without a continuing supply of critical metals not found in this country, American industry in time would grind to a stop, as would rail, road, and air transportation. Civilization as we know it today would cease to exist. The American way of life would end. To see that it does not end is the job of the United States Navy.

Why, it has been asked, does the Navy need to carry the atom bomb in its planes? Why does it need super carriers and bombers of longer range? The Navy says it is keeping up with the development of weapons, just as the other services are doing. If it wants to destroy an enemy submarine base, it wants the means of destruction—not the peanuts of a TNT bomb. Furthermore, the enemy's range of defense by the use of aircraft has increased; so the carrier's range of attack must be increased. That is all there is to the Navy's demand for more powerful aircraft, which require bigger and more modern carriers.

Naval strategy must be flexible. There is no single plan. There are numerous plans. If the enemy strikes there, or there, or there, the Navy has a plan to meet the attack at those points around the globe. It may fight in the Baltic, in the North Sea, in the Mediterranean, in the Pacific, at all points subject to submarine and air attacks. It must destroy the raiders, or be itself destroyed.

A submarine is a tiny object to detect under the sea. But it can't always stay at sea. Despite submarine tankers and supply subs which may permit a modern submarine to stay at sea for months, eventually it must return to base. The Navy will strive to destroy those bases no matter where they may be.

The Navy may ask the Air Force to help it in this destruction; the Navy, in turn, may assist the Air Force and the Army in special missions—just as it did in Korea. That was an example of integration. That was integration in the field, the scene of action.

Actually, there is no Air Force-Navy squabble. There are disagreements, yes; there is misunderstanding, too. In a democracy there always are two sides to any question; and there are partisans who grow heated about this or that. But in war we are a united people. We have to be, or perish. And in a war that is how the armed forces will be—united to achieve a common goal, victory.

... Cy Caldwell

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Cook to Coordinate AMC and ARDC

Differences arising between the Air Materiel Command and the Air Research and Development Command will now be resolved by Lt. Gen. Orval R. Cook, Air Force Deputy Chief of Staff/Material.

AF Secretary Harold E. Talbott has announced that Cook, who is responsible for production and procurement, will have "AF purview over both AMC and ARDC to eliminate an overlap of functions" between the commands.

Lt. Gen. Laurence C. Craigie, Deputy Chief of Staff/Development, will continue to have responsibility for research and initial phases of development, Talbott said.

NATC Asks Board to Retain Control of Names

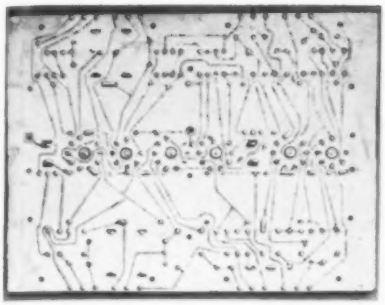
National Air Taxi Conference has notified CAB that it is opposed to the proposed amendment to Part 298, which would eliminate prohibition against taxi services using such words as "airways, airlines, etc."

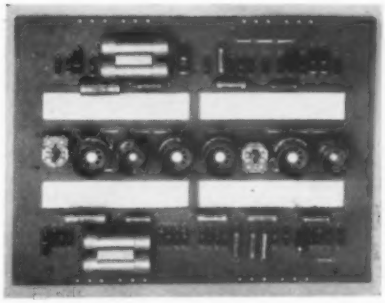
In a letter to CAB, Evelyn V. Waters, NATC executive secretary, stated that the amendment "would open the door for operators to adopt any name they see fit and use the same in competition with certified airlines. Since under Part 298 air taxi operators are allowed to operate scheduled service even between points served by certificated carriers, the letter concludes: "We feel that the board should maintain sufficient control over the names used by air taxi operators to prevent the public from being misled as to the character of such service, especially between competitive points."

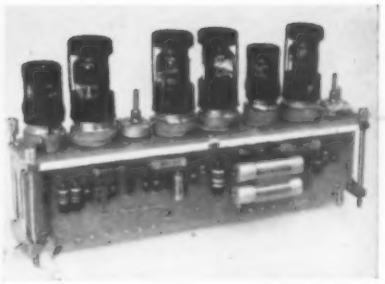
CAB Finds Pilot Error Cause of C-46 Crash

Tracing a general pattern set in previous C-46 accidents, the Civil Aeronautics Board has found that poor pilot judgment was the probable cause of a Slick Airways' C-46F crash near Windsor Locks, Conn., on March 4, 1953. The accident took the lives of the two-man crew. The CAB reported that there was no evidence of mechanical failure or malfunction of either the aircraft or engines.

After missing a first approach to the airport, the Board charged, the pilot displayed poor judgment in attempting to circle the airport under the overcast in a rainstorm at night rather than execute a standard instrument approach.







THREE STAGES in mechanized electronic production: the base board after dip soldering (left); the resistors, condensers, and tube sockets clinched in place on the reverse side of the board (center); and the completed assembly.

USAF Mechanizes Electronic Production

Results of three years electronic production research disclosed by Stanford Research Institute.

By William D. Perreault

WHILE the U. S. Navy has been occupied with its "Project Tinkertoy" (see page 40), the U. S. Air Force has taken a completely different approach to the same problems—the simplification and automatization of electronic equipment production.

For more than three years Stanford Research Institute at Stanford, Calif., has been actively at work adopting present day electronic components to automatic production line methods for the USAF. This contrasts sharply with the Navy's efforts to design completely new components which better lend themselves to productionizing.

It might be said that the real accomplishment at Stanford, where work is still continuing, has been the establishing of proof that electronics manufacture lends itself to automatic production. It has accomplished this by singling out compatible methods of machine-handling each successive step of electronic equipment assembly. Beyond this Stanford has designed, built, and operated specialized machines which accomplish some of the more complicated elements of the job.

The need for automatic production is best emphasized by the recent and continuing growth of the industry itself. During 1952, according to Stanford, more than $6 billion in electronic equipment was produced. This was 50% greater than the World War II peak. Yet virtually all electronic equipment fabrication, in contrast with other American manufacture, is by hand.

The goal of automatic production is to increase production capacity while cutting down the specialized and expensive training required of factory personnel. This must be accomplished without adversely affecting reliability or flexibility and preferably with an economic gain.

Even at this early stage in development of automatic electronic equipment production for the USAF, Stanford claims that these goals have been achieved. The job has been done by the building block method. Rather than design a machine to produce a particular unit, such as a receiver, transmitter, etc., Stanford has worked toward machines which do a particular job—i.e., insert resistors and capacitors into the base board.

Existing Methods Surveyed

Because of this approach the same basic machine can serve any phase of the electronic industry, regardless of the end product. More machines will be required, thus cutting unit tooling costs. A modification in the equipment circuitry or a change in production requirements to another type equipment would not make obsolete the manufacturer's assembly equipment. Failure to attain these objectives has defeated earlier attempts at automatic production.

Basically, this is how Stanford approached the problem and some of its accomplishments. After first making an extensive survey of existing methods and materials used in electronics manufacture, Stanford established a "Construction Techniques Classification System." This system classified some 50 different approaches, combinations of materials, and assembly method that were then in use. These were reviewed to pick the approach to each step which best fitted over-all production requirements.

Greatest progress has been in making the conducter. Using plastic-impregnated glass cloth for the base material, Stanford routes it to a punch press where it is cut to size, to pressure rollers where a 0.001 inch layer of copper is laminated to the plastic, and then to another punch press where attach holes for individual components are punched.

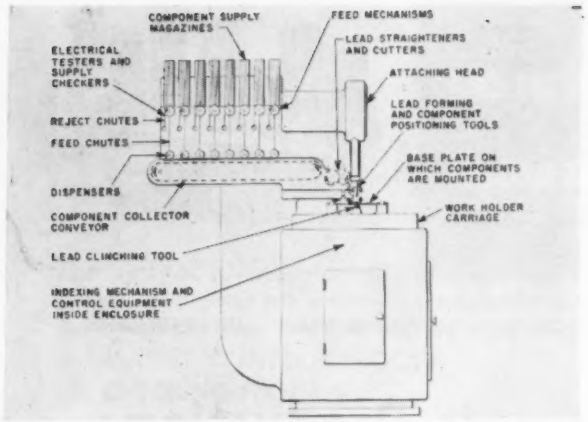
It should be emphasized that, as Stanford sees it, all of these operations are handled automatically. Conveyor belts carry material from one machine to another, cycle time is automatic, etc.

The base plate is then covered with a stencil which outlines the electrical circuits to be used in the electronic component. Stanford developed several important contributions to the currently used processes, i.e., a magnetic chuck which holds the stencil to the base with five ounces pressure per square inch, insuring precision circuits.

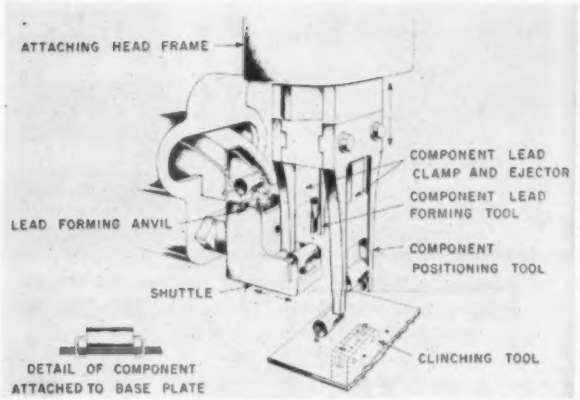
The acid resistant which Stanford uses to protect the copper of the base plate in areas defined by the stencil is also special. It is a wax flux resist. In addition to protecting the copper during etching, it serves as the flux during dip soldering later in the process. After the resist is sprayed onto the base plate, the stencil is released and moves through cleaning and drying cycles to be used again.

The base plates, up to 600 of them at a time, are lowered into an etching bath of nitric acid. By using nitric acid rather than ferric chloride, Stanford has cut etching time from 3 minutes to 30 seconds. Also, some 13 pounds of copper can be recovered hourly from the 15 gallon acid etch bath. Half of the etch bath is continuously regenerated by simple distillation.

Removed from the etching bath, the base plate is rinsed, neutralized and



TYPICAL ASSEMBLY MACHINE is shown feeding components from special magazines onto base board before soldering.



DETAIL OF ATTACHING HEAD which forms resistor and condenser leads and clinches units to the base board.

rinsed again, then carried to a double headed rivet machine where two rows of contact rivets are automatically installed. The base plate moves on to successive cartridge-type machines which feed resistors, condensers, and other components onto the base plate in proper sequence. Individual machines are used to handle different size units of each type.

These same machines (see drawings) have mechanisms which straighten the lead wires on the resistors and condensers, cut them to the right length, and clinch the wire ends on the underside of the base board. Condensers are inserted in clips which are also automatically installed. Seven- and nine-pin tube sockets pass through the indexing turrets of separate machines, are oriented, and are automatically installed.

Three-Second Soldering

The whole baseboard, containing all of these elements, is lowered into a bath of hot solder, maintained at 480° Fahrenheit. Up to 50 components on a single board have been soldered in this manner in three seconds. The rosin flux has proved very effective. The wax base melts away and the flux is consumed, leaving a clean board.

After soldering, the assembly is spray cleaned, dried, and the circuits are electrically tested automatically. Another mask is applied to the conductive side of the base board to outline the areas which must be given a protective coating against heat, humidity and physical abuse. Coatings tested were subjected to temperatures ranging from minus 65° Centigrade to plus 200° and to humidity variations up to 98% relative humidity and to dense salt fog.

Stanford found that the method of applying protective coatings to the electrical circuits after soldering is more important than the materials used. Three different types of coatings were used: hot spray, powdered plastic sprayed through an open flame, and the use of two stable chemicals which, when mixed in an air stream, react to form a coating which dries almost instantly on contact. The mask is then removed.

The base plate is then centered on the support element of the assembly in which it is to be installed. In the case shown, this requires that it be bent into a "T" shaped arrangement and attached to the frame. Other machines then feed the seven- and nine-pin tubes into the sockets, install tube shields, whereupon the whole assembly is given an electrical check out.

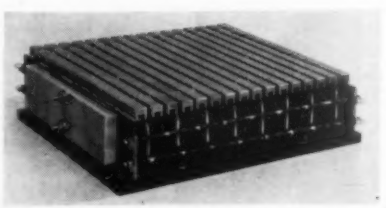
In the assembly shown, a low power video frequency signal level application, all the tubes are installed in a single line, although this works to the detriment of cooling, in order to provide a compact form. It might be noted that the legs of the T separate heat-producing areas, helping to alleviate heat problems.

As Stanford sees it, there's no reason why these processes can not be applied to a point where the completed and tested assembly is delivered into a shipping carton, the labels pasted on, and the package sealed.

Coordination Needed

Stanford is the first to acknowledge the time that will be required to get the industry keyed to such a system. Institute officials stress that the success of such a program depends on the coordinated efforts of electronic engineers who must design circuits readily adaptable to such methods, materials processing engineers, and machine designers who must exhibit ingenuity in providing machines which will produce precision assemblies and yet have the flexibility which will keep costs in line. • • •

DIP SOLDERING in process.



MAGNETIC CHUCK for stencil.

Reports Show Increase In Aircraft, Engines

Complete civilian aircraft totaling 1,023,300 pounds airframe weight were shipped during July, representing a 10% increase over June shipments, according to a joint Bureau of Census-CAA report. July shipments included 402 planes valued at $23.1 million, compared to June's 339 planes at $21 million.

In July, 579 engines totaling 400,900 hp were shipped for a five per cent increase over the June number.


Designers and manufacturers of
dependable airborne electronic
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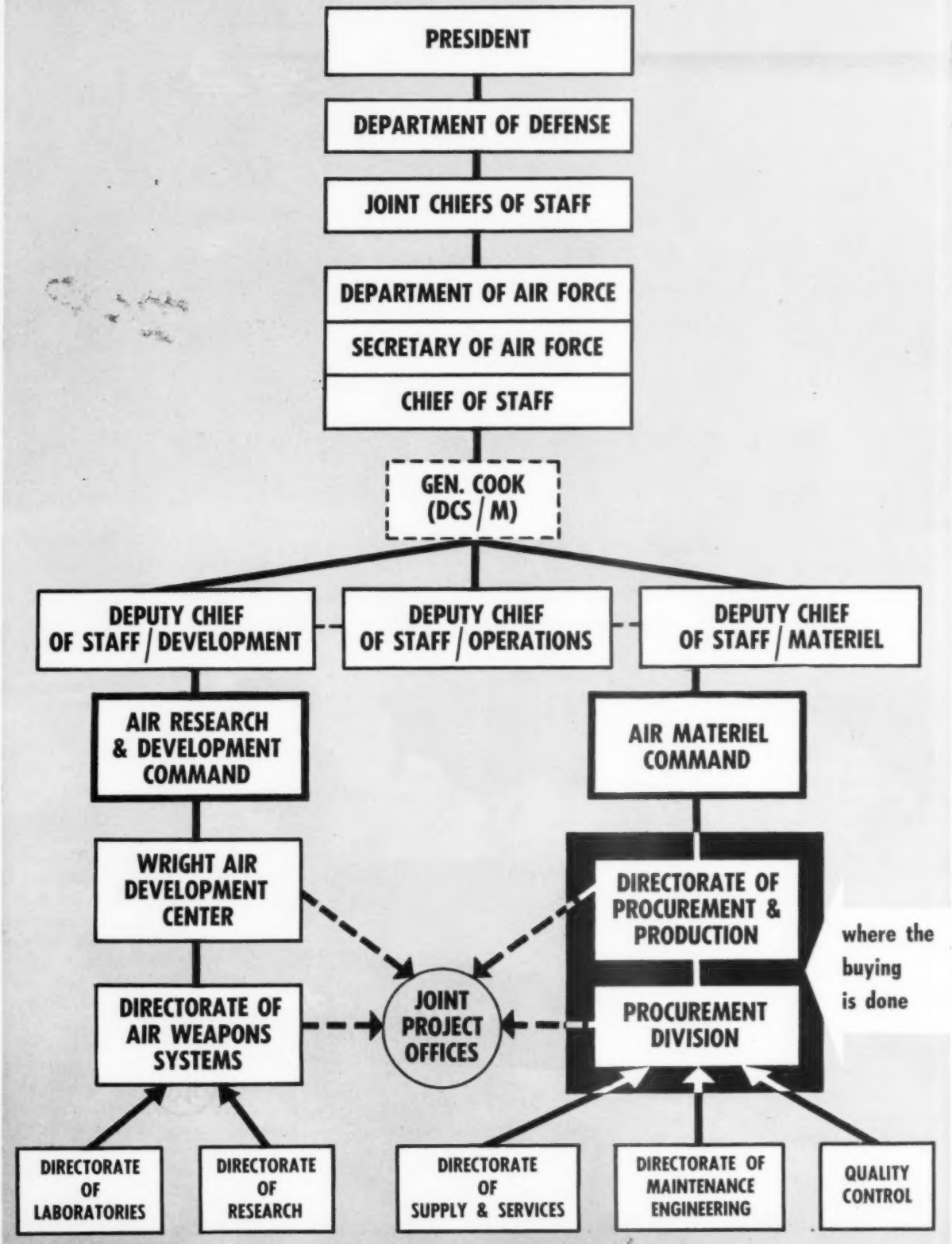
BUYING INFLUENCES IN THE AIR FORCE



Air Force Buying: The How and Where

Widespread influences guide USAF purchases of aircraft accessories and equipment.

IN THE AIR FORCE, just as in industry, procurement is the product of the buying influences of many groups. These influences make themselves felt through the usual steps in purchasing procedure:

- **A need is recognized;**
- **It is confirmed** and evaluated;
- **Decisions are made** on desired type of product;
- **Specifications** are drawn up;
- **Product makes** and suppliers are considered;
- **Desired product and supplier** are determined and authorization to buy is made;
- **Purchase is made.**

At each of these steps in the purchasing procedure a number of people have some voice in the matter. These people usually fall into groups having common functions and generally the same group levels exist in the Air Force organization as in industry:

- **Top Management**—(policy);
- **Operating Management** — (production control);
- **Engineering and Research**—(technical control);
- **Purchasing.**

The chart on the opposite page is designed to show the groups in the Air Force organization which constantly exert key buying influence. The top management level follows the chain of command to include the Deputy Chief of Staff offices; the operating management level is made up of Headquarters Staff, AMC, and the Directorates shown; the Engineering and Research level is made up of Headquarters Staff, ARDC, WADC, and the Directorates shown; and the purchasing level is found in the buying branches of the Procurement Division of the Directorate of Procurement and Production, AMC.

Influences of these groups on purchasing are as varied as are the different types of and procedures in purchasing. In the equipment field alone there are basic differences in procedure for original equipment purchases, supporting equipment purchases, and changed equipment purchases.

Traced below are the influences exerted by each of the groups in the procurement of Government Furnished Aircraft Equipment (GFAE) once a complete airplane program has been established.

Suppose Headquarters USAF has approved a recommendation from Strategic Air Command to make a major equipment change in a production aircraft so it can perform missions other than those originally planned. Here is how each of the groups on the chart will influence this procurement.

First we have the command actually recognizing the need. It's recommendations, usually in general terms, will go into the Pentagon hopper for evaluation and confirmation. In this case 12 officers at the Directorate level of the Air Staff combine review forces to form an Aircraft and Weapons Board. Joint evaluations and confirmations of the need, followed by recommendations, are made by this board to the Air Council, which is composed of the Vice Chief of Staff, Deputy Chiefs of Staff, and the Inspector General. As an important change proposal these recommendations may be reviewed by the Secretary of Air and his superiors, going as high as the President.

Thus we arrive at the headquarter's decision that a major equipment change in a production aircraft is desirable.

Equipment Review Made

A review of equipment by ARDC's Wright Air Development Center engineers is made at the request of the Deputy Chief of Staff/Development to learn whether any available or developmental equipment will be suitable. In reaching his conclusions WADC's Chief of Operations relies highly on his Directorate of Laboratories and coordinates with AMC's Director of Procurement and Production to determine the ease of quantity production. If an effective point of the production change has been prescribed by Headquarters USAF, effective coordination between WADC and AMC is mandatory.

The proposed change unquestionably will affect supply and maintenance requirements. Therefore recommendations to WADC from AMC's Director of Procurement and Production reflect estimates of spares requirements and recommendations to ensure ease and accessibility of maintenance from the Directorates of Supply and Services and Maintenance Engineering.

Only recently has there been delegated to one Deputy Chief of Staff the full responsibility for research and development as well as production and procurement. The move is expected to eliminate many of the conflicts of engineering and production interests at this stage.

On the basis of ARDC's report the Deputy Chief of Staff/Development decides upon the desired type of equipment. WADC may have recommended a couple of bread-board experimental models, which it felt could be readily developed to perform the tactical function and which would meet the maintenance and productibility requirements recommended by AMC. It now has the task of developing specifications for the item from these models.

Industry specialists will almost always participate in this activity. Full consideration is given continually to maintenance and producibility requirements. While reviewing the engineering adequacy of existing products and developing specifications for the new item, WADC (in conjunction with AMC) has completed the procurement step of evaluating makes and considering suppliers.

Assume now that the effective point for the equipment's introduction into the aircraft is far enough ahead and industry's productive capacity is adequate to allow truly competitive procurement. The desired product has been determined. The Plans and Programs Office of AMC's Directorate of Procurement and Production through the Procurement Division's Production Control Office authorizes the Equipment Branch to buy. Authority is a procurement directive issued by the Deputy Chief of Staff/Materiel.

The field of possible suppliers is narrowed down as the buyer develops the required monthly quantity production schedules for the item. These schedules are governed by the airframe availability and production lead time necessary so as not to delay the scheduled delivery of the aircraft. Facility capability and financial ability reports on numerous equipment manufacturers are requested from the appropriate Air Procurement Districts by the Procurement Division of AMC. These reports evaluate the manufacturers' ability to meet the projected monthly production schedules.

Finally the complicated procurement machinery of buying by negotiation or bid is put in motion and the

purchase is made. It is obvious that the members of the manufacturing group considered by the buyer for the contract at this point reflect, and are probably the direct result of, these many influences.

This review of key buying influences on USAF procurement points up an almost insurmountable problem facing the equipment manufacturer, that of acquainting the appropriate people with his products' capabilities.

Many manufacturers have deluded themselves by believing they have an equal chance with all others at the time the Air Force buyer in AMC's Procurement Division goes to work. Only a few manufacturers have realized how influences outside this division have greatly affected purchases. These few have been trying with varying degrees of success to reach those key influences.

Today many equipment manufacturers are opposing the Air Force's plans for the Single Prime Contractor to manage the weapons system. Although the plan probably will necessitate sales force reorganizations and new selling programs for most of the field, at least one industry observer feels the chances of getting the relevant information to key buying influences will be greater in the Single Prime Contractor's organization.

Fewer people will influence purchasing in the prime contractor's organization, he reasons, than in the sprawling Air Force organization. More equipment manufacturers, he says, should begin evaluating the SPCP from this viewpoint. • • •

Investment Analysis Sees Prosperity

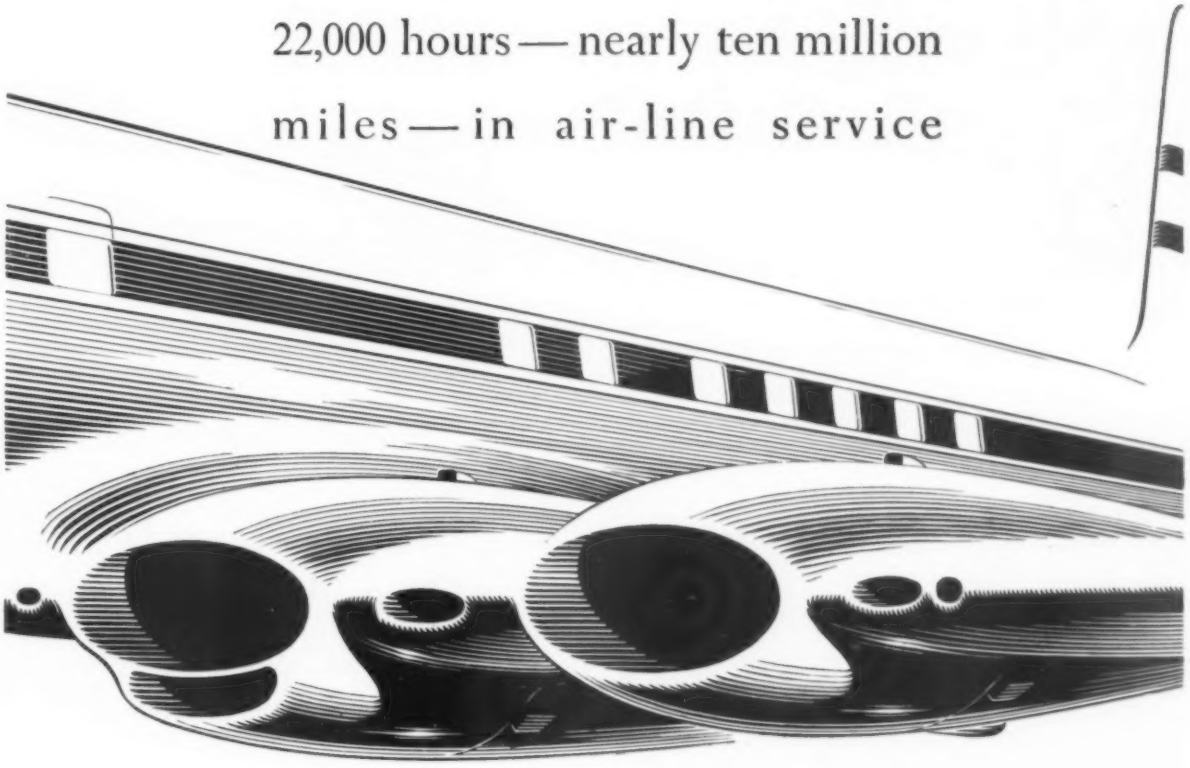
A sharp boost in aircraft industry earnings with the scheduled expiration of the excess profits tax on January 1, 1954, is viewed as likely in a financial analysis by Arthur Wiesenberger & Co., New York investment house. The study warns, however, that the extent of the earning pick-up could be limited by the "indeterminable factor of renegotiation."

Wiesenberger's analysis cites Defense Secretary Wilson's credo of concentrating contracts in the hands of a few aircraft manufacturers for maximum efficiency and of eliminating production peaks and valleys as likely to prove beneficial to the larger plane companies. The study adds that the USAF's $40 million in unexpended funds and $23 million for new aircraft, and the Navy's $6 million in unexpended money, all as of July 1, represents "quite a bundle," and concludes that "it leaves little doubt of a prosperous road ahead for the plane builders."

COMET

The New World Airliner

Comets have already flown 22,000 hours — nearly ten million miles — in air-line service



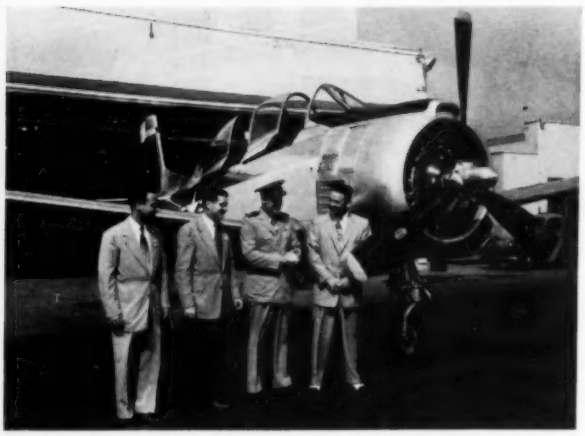
They are now clocking 150,000 miles a week

DE HAVILLAND of GREAT BRITAIN

DH ENGINES

DH AIRCRAFT

Record breaker. Navy Douglas F4D Skyray which set a new world's speed record of 753.4 mph on October 3 is shown above. Previous British mark of 737.3 mph had lasted only eight days. Skyray achieved 761.44 mph during one of its four runs over the three-kilometer course.

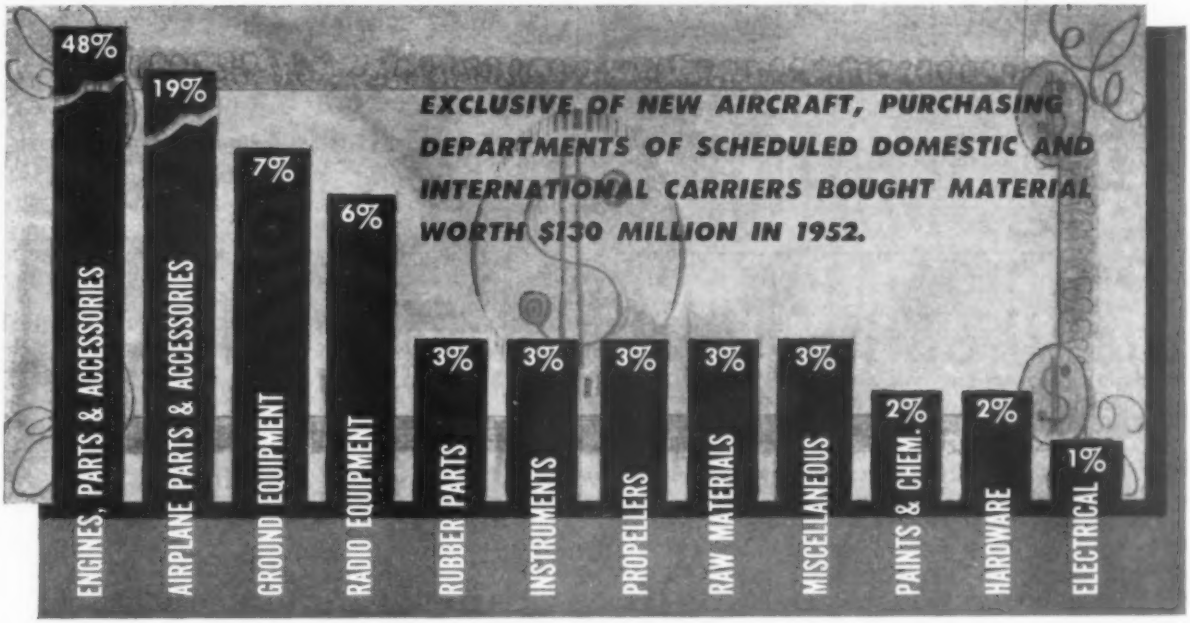


First T-28B Navy trainer to come off North American's production line made its first flight one week ahead of schedule at the manufacturer's Downey plant. Welcoming it, above, are representatives of the Bureau of Aeronautics and North American.

The Military Scene

Rocket boosts Matador into the air in first photo of the pilotless bomber being launched at Cocoa, Fla. Turbojet takes over as power source after initial rocket impulse. The aircraft, designated the B-61, is built by Glenn L. Martin.

WHERE THE AIRLINE ACCESSORY DOLLAR GOES



Rigid Controls Shape Airline Buying

Cost plays an important role in final choice but, despite bid system, is not always decisive.

By Eric Bramley

A TIGHT SYSTEM of controlling engineering and expenditures for accessories, to insure not only that the best items are bought but that the best price is obtained, is used by American Airlines, the largest U.S. air carrier. A look at the buying influences and the chain of decisions in American is of interest, since it is indicative of general industry practice.

American's accessories purchases go through a screening and sifting process that involves a service engineering group, a project board review, an equipment committee in certain instances, and the president and board of directors for major items. Entering into the discussions at almost all stages is the purchasing department.

On existing equipment—DC-6's and Convairs—a request for an accessory change can originate in a number of places in the company—maintenance, operations, an employe suggestion, etc. However, it is most likely to start in the standards and procedures group in Tulsa, headed by John Casey. This group receives all "squawk" sheets, copies of service report records, causes of delays, etc. Thus it is in a position to put the finger on trouble spots and to recommend that changes be made before a situation becomes serious.

For example, the selector valve on the blower clutch may be causing trouble. The maintenance department may raise the danger signal. Its request for action will be forwarded to the service engineering group at American's Tulsa overhaul base.

This group, headed by W. H. Hall, with W. E. Spearman as assistant manager, has experts in all fields. Dave North is project engineer on systems, Bill Neeley on powerplants, propellers and accessories; A. J. Snyder on electrical equipment; Bruce Olsen on structures; A. W. Perkins on accommodations and field equipment, and E. A. Ronchini on overhaul equipment.

Within this group the entire problem will be investigated—can the present valve be modified, is a new-type valve needed, etc. Consultations will be held with maintenance. Service engineering, in short, will come up with the best solution. Purchasing will obtain prices and delivery schedules.

After service engineering makes a decision, including a cost estimate, the entire matter is presented to American's project board for review. Included on this board, in Tulsa, are D. E. Tait, manager of the supply branch, which includes purchasing; E. P. Lalley, cost and budgets; W. H. Hall, service engineering; J. T. Farrah, industrial engineering; J. H. Reniers, Jr., production; E. C. Doherty, inspection. Marvin Whitlock, assistant vice president-overhaul and supply, and John Casey may also sit with the board.

It is unlikely that this board would change service engineering's decision as to the type of valve to be used, but it would decide whether or not the project would proceed. In the case of a major valve change, service engineering or the board might recommend that a number of the valves be obtained for service tests. (Under such circumstances, purchasing would negotiate with the valve manufacturer—American wants to know at this stage what the prices will be on quantities of valves in case service tests are successful, who will stand development costs, etc.).

If the board approves service engineering's findings, the project must then be okayed either by Whitlock, G. J. Brandeweide, vice president of maintenance and supply, or a top equipment committee, depending on the amount

of money involved. Members of the equipment committee are Brandeweide; L. G. Fritz, vp of operations; W. J. Hogan, vp and treasurer; R. E. S. Deichler, vp of sales, and M. G. Beard, chief engineer.

In this purchasing process, another group enters the picture at an early stage in the consideration of all new equipment or if a major change is to be made in an accessory. This is the engineering department in New York, under Beard, which works with all interested departments and purchasing.

Order for a new or modified valve, or any other equipment, is handled by the purchasing department. All of American's purchases are on a bid system, but the company does not necessarily accept the lowest bid. The manufacturer's ability to produce on time, the quality of his other products that may be used by the airline, and other factors may affect the final decision. After this decision is made, the vendor makes no changes in the product that would cost money without consulting AA's purchasing department.

In the case of a new aircraft, as differentiated from presently operating equipment, about 80% of accessories will be decided upon by the plane manufacturer. American will, of course, recommend through the engineering department in New York, which administers the technical phases of the contract, that the manufacturer ask an accessory producer to do something about a specific problem on a piece of equipment or to supply a certain item. However, it is to the airline's advantage to have most accessories placed on a new plane by the manufacturer because of the warranty problems involved, American believes.

For a new plane, American buys engines separately and delivers them to the airframe manufacturer. The same applies to communications equipment and buffet equipment. Decisions on engines are, of course, made by top management. On radio equipment, the communications department would make the decision after conferences with purchasing officials on prices and deliveries.

• • •

Non-Scheduled Line Holds Travel Plan Card

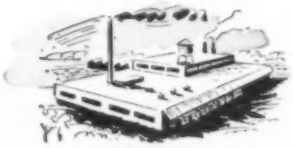
North American Airlines, the scheduled airlines' strongest non-scheduled competitor, may also be one of their best customers. The reason, AMERICAN AVIATION learns, is that North American holds an Air Travel Plan "Q" Card, issued by Eastern Air Lines, and uses it to buy scheduled tranportation to points not on its course of operations.

Specifically, the card allows the holder to purchase airline transportation for anyone with payment at the end of the month or some other specified billing date.

North American uses it to assure its passengers of complete transportation.

AVIATION

MARINE



INDUSTRIAL

BROADCASTING

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RADAR, PULSE, EXPERIMENTAL EQUIPMENT AND SPECIAL TYPES

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Federal offers you one of the nation's most diverse stocks of RG type cables—including the Federal-developed low-temperature, non-contaminating thermoplastic jacket.

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Before you specify cable—or complete cable assemblies—for any general or military application, get the facts and figures from Federal. *We have the answer or we can get it!*

FEDERAL HAS A NEW CABLE CATALOGUE

This new 28-page buying guide contains a world of up-to-date information on Federal's quality-controlled cables, plus numerous useful tables and diagrams. For your free copy, write to Federal today, Dept. D-743.

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In Canada: Federal Electric Manufacturing Company, Ltd., Montreal, P. Q.
Export Distributors: International Standard Electric Corp., 67 Broad St., N. Y.

When & Where

Oct. 28-30—Southeastern Airport Managers Association, Annual Convention, Marlin Beach Hotel, Fort Lauderdale, Fla.

Oct. 29-30—National Business Aircraft Assn. (formerly CAOA), 6th Annual Forum & Meeting, Park Plaza Hotel, St. Louis, Mo.

Nov. 3-4—Transport Aircraft Hydraulic Conference, sponsored by Vickers, Inc., Park Sheraton Hotel, Detroit, Mich.

Nov. 3-6—National Association of State Aviation Officials, Annual Meeting, Edgewater Gulf Hotel, Edgewater Park, Miss.

Nov. 3-29—American University, 7th Air Transportation Institute, Washington, D. C.

Nov. 4-6—SAE Committee on Aircraft Hydraulic & Pneumatic Equipment, Statler Hotel, Washington, D. C.

Nov. 5-6—SAE, Fuels & Lubricants Meeting, Conrad Hilton Hotel, Chicago.

Nov. 16-17—American Society for Quality Control, Aircraft Quality Control Conf., Biltmore Hotel, Dayton, O.

Nov. 17-20—Aviation Distributors & Manufacturers Assn., Annual Convention, Broadview Hotel, Wichita, Kansas.

Nov. 19—National Air Taxi Conference, Annual Meeting, Broadview Hotel, Wichita, Kans.

Nov. 19-21—National Aviation Trades Assn., Annual Convention, Broadview Hotel, Wichita, Kans.

Dec. 1-2—Frequency Responses Symposium sponsored by the American Society of Mechanical Engineers, Hotel Statler, New York City.

Dec. 3-5—7th annual Arizona Aviation Conference, Yuma, Ariz.

Dec. 17—17th Wright Brothers Lecture (sponsored by IAS), U. S. Chamber of Commerce Auditorium, Washington, D. C.

Dec. 17—Wright Brothers Memorial Dinner, sponsored by Aero Club of Washington, Statler Hotel, Washington, D. C.

Apr. 12-14—Airport Operators Council, 7th Annual Meeting, Tampa, Fla.

INTERNATIONAL

Oct. 26-28—Air Industries and Transport Association of Canada, Annual Meeting, Chateau Laurier, Ottawa.

Nov. 1-22—IATA, Traffic Conferences, Honolulu.

Nov. 17—ICAO, African-Indian Ocean Regional Air Navigation 2nd Meeting, Santa Cruz, de Tenerife, Canary Islands.

West Coast Talk

By Fred S. Hunter

Employes of Hughes Aircraft Co. are privately speculating whether he will go through with plans to build a great underground plant at Las Vegas, Nev. Most of them think he will—unless the government pulls the plug on him. They reason this is a typical Hughes project. Others might talk about the wisdom of being prepared for enemy attack by constructing vital defense facilities underground where atom bombs can't penetrate. But Hughes would go ahead and act. That seems to be just what he has been doing. He spent most of the past year in Las Vegas buying up acreage.

•

There are hints the gamblers at Las Vegas aren't too happy about Hughes. They're interested in playboys, not workers. There is no industry in Las Vegas now. Industry might slow up the gay pace.

•

The mishap to the Howard Hughes flying boat, damaged in its dock when a dike broke, means it undoubtedly will have a new owner before it flies. The Reconstruction Finance Corp. holds title now. But the RFC goes out of business on June 30, 1954, and any assets it still retains will be turned over to the Treasury Dept. It is highly unlikely repairs to the boat can be completed in time to fly it before next June 30.

•

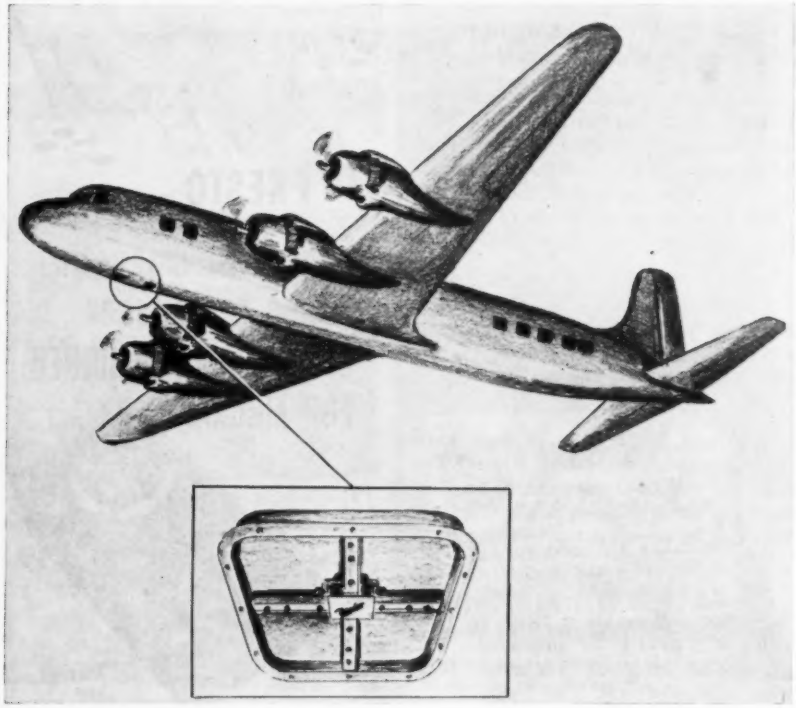
New interceptors are on the way that will go about twice as fast as present fighters. Even the taxiing will have to be automatic. The timetable for an interception flight will be just about 15 minutes, because of the critical fuel consumption of afterburners. The Navy's experience in its speed tries with the Douglas F4D gave an indication of how the problem will increase as thrust is increased to make planes faster. With the afterburner cut in, the J40 engine used up 50 gallons a minute. Tanks run dry fast at that rate.

•

Jack McGowen, chief project engineer on the Douglas DC-6 series, thinks there will be considerable cruising at the 25,000-foot altitude with the DC-7. He reasons that the airlines have a sharp eye for anything that might reduce fuel consumption and hold down maintenance costs. By going up to 25,000 feet, it will be possible to cut back from 1800 hp to 1700 hp and still net the same cruising speed that maximum cruise power would produce at the more conventional altitude of 20,000 feet.

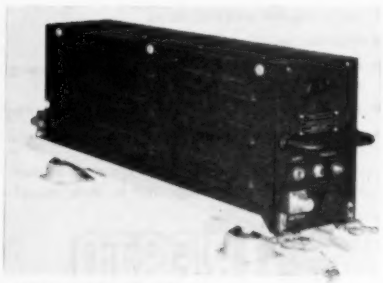
•

WEST COAST MISCELLANY—Gilfillan Bros. lease with San Bernardino County on the Fontana Airport is for two and a half years with options. Makes a nice, secluded field for its **radar flight tests.** Gilfillan used to have its test installation at the Ontario International Airport. But when Northrop, Lockheed, and Douglas all moved into this field, it got a little too crowded for the radar testers. . . . **Langhorne Washburn,** assistant to Stanley Hiller, Jr., is on leave from the helicopter company to work with the Citizens for Eisenhower Congressional Committee on next year's congressional elections. . . . **Paul Mantz** lives on his 90-foot yacht at Balboa. . . . **J. Edwin Jones,** former president of Pacific Overseas Airlines, has left Overseas National Airlines, where he was a pilot on the Korean air lift, to check out a crew on a Grumman Mallard executive for a Texas oil man. . . . Northrop was highly pleased over the **demonstration of range made by the F-89** in flying nonstop from Edwards AFB to Dayton. Plane was an F-89C, but modifications made it practically a counterpart of Northrop's current rocket-carrying F-89D interceptor. . . . **Rear Adm. Leslie H. Gehres,** retired, is devoting full time as staff coordinator for the San Diego celebration of the 50th Anniversary of Powered Flight. . . . **Rohr's power package for the B-52** is one of the first to use titanium and magnesium as the two most prominent materials and use weldments for major structural components in its design.



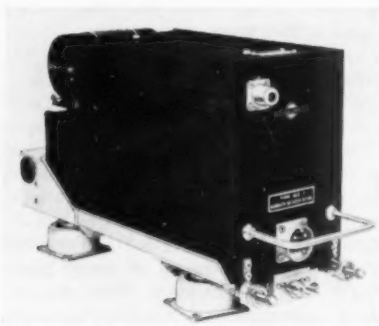
• FLUSH LOOP ANTENNA

Model: MN-104
Mfr.: Bendix Radio Div., Bendix Aviation Corp.
Weight: Approx. 6 lbs.
Size: 16″ sq., pan housing 1½″ deep
General: Bendix's flush-mounted magnetic loop antenna incorporates four ferrite collector bars approx. one inch in thickness. Located in a shallow removable dish under plastic plate fitting aircraft contour, the pick-up bars concentrate energy into a small pickup loop in the center of the unit. 1



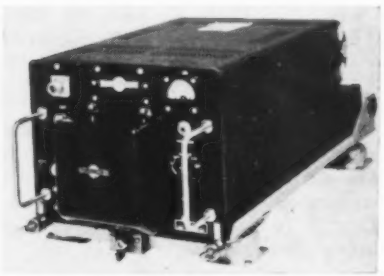
• VHF RECEIVER

Model: RA 18B
Mfr.: Bendix Radio Div., Bendix Aviation Corp.
Weight: 21.3 lbs.
Size: ½ ATR
General: A 360 channel VHF communications receiver with 50 kc channel spacing. Thirty-one crystals provide full crystal control through use of Bendix "crystal saver" circuit. Sensitivity better than 2.5 micro volts. Operates on 27.5 volt d-c or 115 volt a-c (300 to 1000 cps) with output of 200 milliwatts. Rejection characteristics allow double channel duplex operation where transmitter receiver frequency difference is 5.5 megacycles, transmitter power does not exceed 50 watts and antenna spacing is at least 20 feet. 2



• MARKER BEACON RECEIVER

Model: 51Z-1
Mfr.: Collins Radio Co.
Weight: 10.5 lbs.
Size: L-14-5/16″, W-4⅞″, H-7⅝″
General: Output—aural 0.1 watt into 500 ohms; visual—preset at 3.3 volts for the three modulation frequencies. The model 51Z-1 has high image rejection. Output transformer with three tuned secondaries is used in place of separate filters for the indicators. A carrier-operated squelch is applied to both aural and visual output channels to alternate the receiver output in the absence of a signal and to provide more rapid increase or decrease of indicator lamp intensity as the signal level changes. 3



• VHF TRANSMITTER

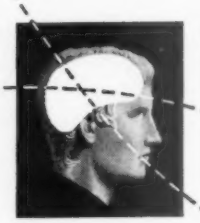
Model: 17M-1
Mfr.: Collins Radio Co.
Weight: 43.4 lbs.
Size: L-19-9/16″, W-10⅛″, H-7⅝″
General: A 50 watt VHF transmitter, the 17M-1 is a 360 channel unit operating as 27.5 volt d-c @ 4 amp standby and 17 amps transmitting. Covers 118.0 to 135.95 megacycles with 0.05 mc spacing. Uses modular construction to ease maintenance. Frequency range plus 360 channel capacity assure long life even with implementation of 50 kc channel spacing. 4

• H. F. TRANSCEIVER

Model: 618 S-1
Mfr.: Collins Radio Co.
Weight: 51 lbs.
Size: L-23-7/16″, W-15-5/16″, H-9-1/16″
General: Operating on 27.5 volts d-c @ 28 amps., 115 volts a-c @ 180 watts with output 100 watts minimum for transmitter, 500 mw into 300 ohm. load for receiver. Range of 2.0 to 25.0 megacycles inclusive. All circuits automatically tuned after channel selector. Used in conjunction with 180L antenna tuner. Only one crystal used for both transmitting and receiving. Modular construction simplifies maintenance. 5

"Remembering"

160,000 TIMES A SECOND



One of the problems in designing an electronic digital computer for airborne automatic controls is that of storing information used by the system.

At Hughes, where the airborne electronic digital computer was pioneered, the problem presented by the memory unit was attacked basically by the Hughes technique of systems planning and analysis. This involved an exhaustive examination of the requirements, an evaluation of the best means for satisfying them, and the design of the simplest possible mechanization consistent with superior performance.

A magnetic drum memory unit was chosen as the most compact and rugged storage device for the airborne digital computer. The unit developed by Hughes provides storage space for more than 2500 19-digit words. Density of the magnetic recording is approximately 100 binary digits per inch. Rotating at 8000 rev/min, the 4-inch diameter drum permits computation at a rate of 160,000 binary digits per second.

From an analysis of the logical integration of the memory unit into the computer system, the unique "floating reference" principle was developed. Instead of standard coincidence-type methods for selecting numbers from the magnetic drum storage, a floating reference system is used in which the memory position is determined by counting word times from the *end* of the preceding operation. This technique produces for this application a performance equivalent to a random access memory and results in a substantial saving in equipment.

A major effort at Hughes is also devoted to adapting electronic digital computer techniques to business data processing and related applications—uses destined for far-reaching peacetime application.

Techniques employed in the magnetic drum memory unit of the Hughes airborne digital computer are reviewed by project members Arthur Zukin (left) of the Radar Laboratory, and Dan L. Curtis of the Advanced Electronics Laboratory.

ENGINEERS

AND

PHYSICISTS

Activities at Hughes in the computer field are creating some new positions in the Laboratories. Experience in the design and application of electronic digital computers is desirable, but not essential. Engineers and physicists with backgrounds of component development or system engineering are invited to apply.

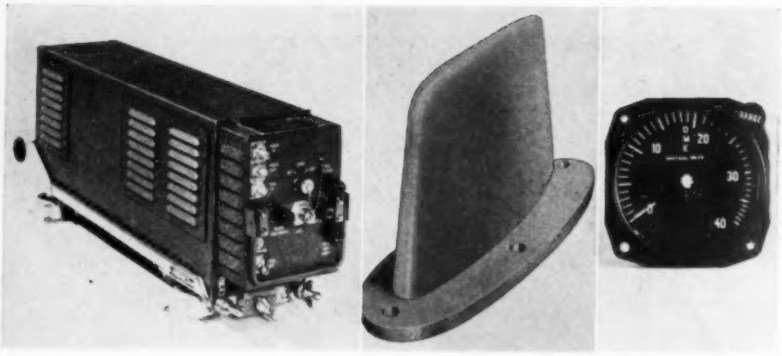
Assurance is required that relocation of the applicant will not cause disruption of an urgent military project.

ADDRESS Scientific and Engineering Staff

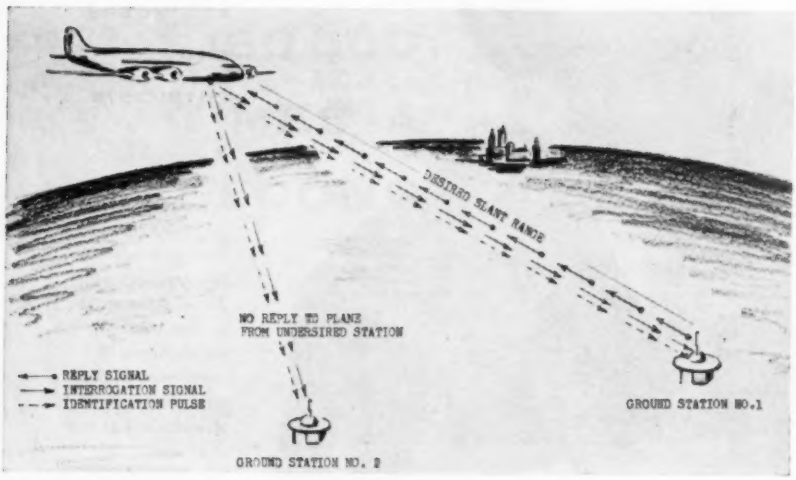
HUGHES

RESEARCH AND DEVELOPMENT LABORATORIES

Culver City
Los Angeles County
California



Receiver Antenna Indicator



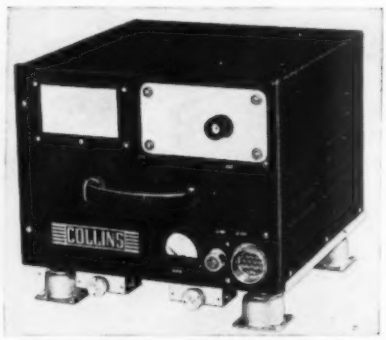
How DME operates.

• DISTANCE MEASURING EQUIPMENT

Model: NA-5
Mfr.: Bendix Radio
Weight: 32 lbs.
Size: Interrogator—½ATR; Range Indicator—3¼" dia.
General: Provides pilot with direct reading in nautical miles between aircraft and selected VOR station. Maximum range 200 miles. Accuracy 0.5 nautical miles or 3%, whichever is greater. Power requirement 250 watts at 27 volts d-c, 25 watts at 115 volts 400 cps a-c, 85 watts at 115 volts a-c 380-1000 cps. 6

• INTEGRATING MOTOR

Model: 120
Mfr.: Summers Gyroscope Co.
Weight: 1.3 lbs.
Size: H-3⅜", Dia.-2½"
General: Features minimum rotor inertia and friction levels. Rotates at speed accurately proportional to applied voltage and motor displacement forms mathematical integral of applied voltage. Nominal sensitivity 4.5 cycles ps/v. 7



• ANTENNA TUNER

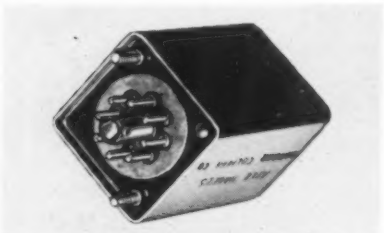
Model: 180 L-2, -3
Mfr.: Collins Radio Co.
Weight: 19 lbs.
Size: L-13 1/16", W-10 3/16", H-7 23/32"
General: Used in conjunction with 618S transceiver or any transmitter with output impedance adjustable to 52 ohms and 50-150 watts output. Input requirement 27 volts a-c at 2 amps, 115 volts a-c 400 cps, 15 watts and 250 volts d-c at .025 amps. Antenna tuning constantly monitored. 8

• GLIDE SLOPE RECEIVER

Model: MN-100A
Mfr.: Bendix Radio
Weight: Approx. 13 lbs.
Size: ½ ATR
General: A 20-channel receiver with frequency range from 329.3 to 335.0 mc. Self-contained plate supply requires 115 volt 400 cps a-c current. Filaments and frequency change circuits require 27.5 volts d-c. 9

• IGNITION ANALYZER

Model: 11-3365-1
Mfr.: Scintilla Magneto Div., Bendix Aviation Corp.
Size: L-19¼", W-7½", H-7⅞"
General: All airborne ignition analyzer controls are incorporated on front panel to simplify usage. Operates on 110 volts a-c. 10



• POLARIZED RELAY

Model: HVO
Mfg.: Barber-Colman Co.
Weight: 10 ounces
Size: Length 2-9/16", width 1-⅝" (square)
General: An ultra-sensitive polarized relay mounted in a hermetically sealed enclosure with standard octal plug. Standard contact configuration is SPDT, null seeking. Tested over 2 million operations with 1 amp resistive, 110 volts, 60 cycle a-c contact load. 11

Pan American-Grace Airways, backed by 25 years of flying experience, has joined the outstanding group of U.S.A. and overseas airlines using the comprehensive AIRWORK engine and engine accessory overhaul program.

AIRLINES AND AIR CARRIERS SAVE OPERATING COSTS WITH AIRWORK OVERHAULS

AIRWORK'S SPECIALIZED OPERATION MATCHES THAT OF THE FINEST MAINTENANCE BASES. Airwork has developed techniques that produce demonstrable improvements in engine life and performance. One airline received CAA time extensions of 55% after switching to Airwork Overhauls.

RESULT: Lower operating costs with decreased shop time.

AIRWORK'S PRODUCTION LINE FACILITIES CANNOT BE DUPLICATED WITHOUT HEAVY INCREASE IN CAPITAL INVESTMENT. 5 domestic scheduled Airlines and 12 Foreign Airlines use Airwork overhauls.

RESULT: Reduced overhead, without sacrificing quality.

AIRWORK'S EXTENSIVE PARTS INVENTORY OFFERS PROMPT DELIVERY FROM STOCK. This reduces the customer's risk of obsolescence — makes it possible to safely carry much less than the normal 6 months' parts supply.

RESULT: A more flexible operation.

AIRWORK ELIMINATES THE RISKS INVOLVED IN ANY CONCENTRATED OVERHAUL OPERATION. Last spring, a flood severely damaged an airline's only maintenance base. A complete breakdown of operations seemed unavoidable. However, they called on Airwork, who had been doing a fixed percentage of their overhauls. Airwork furnished accessories from stock to meet the airline's immediate needs, and accelerated its engine schedules to meet the emergency.

RESULT: Normal flying operations were maintained throughout the emergency.

Why not investigate Airwork's advantages for yourself? Call Millville (N.J.) 1750; Miami (Fla.) 88-3467; or in Washington, D.C. — Jackson 4-1212; New York City — Rector 2-0166. Or write for details.

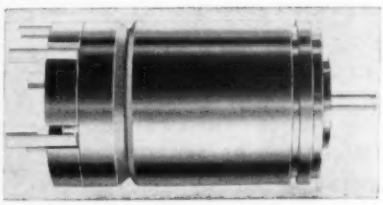
Airwork CORPORATION

Millville, New Jersey

Miami, Florida · Washington, D.C.

• TAPE REPRODUCER

Model: APB-12
Mfr.: Presto Recording Corp.
Weight: 27 lbs.
Size: Full ATR
General: Designed for in-flight music broadcast over aircraft P-A system. Operates on 22 to 30 volts d-c at 3 amperes, and 250 volts d-c for B+ at 10 mils. Records 2 hours at tape speed 3¾"/second. A twin track magnetic tape recorder. 12

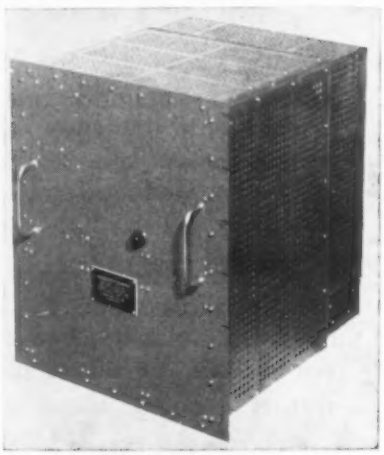


• SYNCHRO TRANSMITTER

Model: R-510/R-500
Mfr.: Kearfott Co., Inc.
Weight: 3.5 oz./3.3 oz.
Size: L-1 23/32", Dia.-1.062"
General: An integral synchro and control transformer, the models R-510 and R-500 operate with maximum error limits of 7 minutes on 26 volt or 115 volts-400 cycle excitation. 13

• FREQUENCY CHANGER

Model: 2261
Mfr.: Varo Manufacturing Co.
Weight: 230 lbs.



VARO frequency changer.

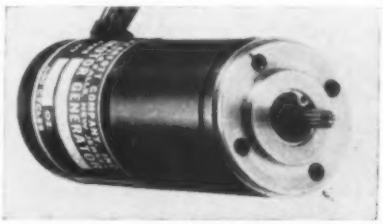
Size: L-20", W-19", H-22¾"
General: Input power is rectified and filtered providing d-c voltage to operate electronic inverter. Operates on 220 (±5%) volt, 3 phase, 60 cycle current. Output 1500-2500 va at 0.7 to 1.0 P.F. log, 115 ± 2% volts on single phase. 14

• ENGINE ANALYZER

Mfr.: Land-Air Inc.
Weight: 22 lbs.
Size: L—13-11/16", W—6-⅝", H—11-11/16"
General: Presents aircraft engine ignition firing and cylinder vibration data on a 5" cathode ray tube for trouble-

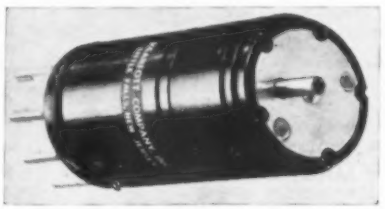
IGNITION ANALYZER

shooting mechanical irregularities. Features a parade dial that permits identification of cylinder number and crankshaft position without changing the pattern trace or interrupting observation. For portable-airborne or airborne use. 15



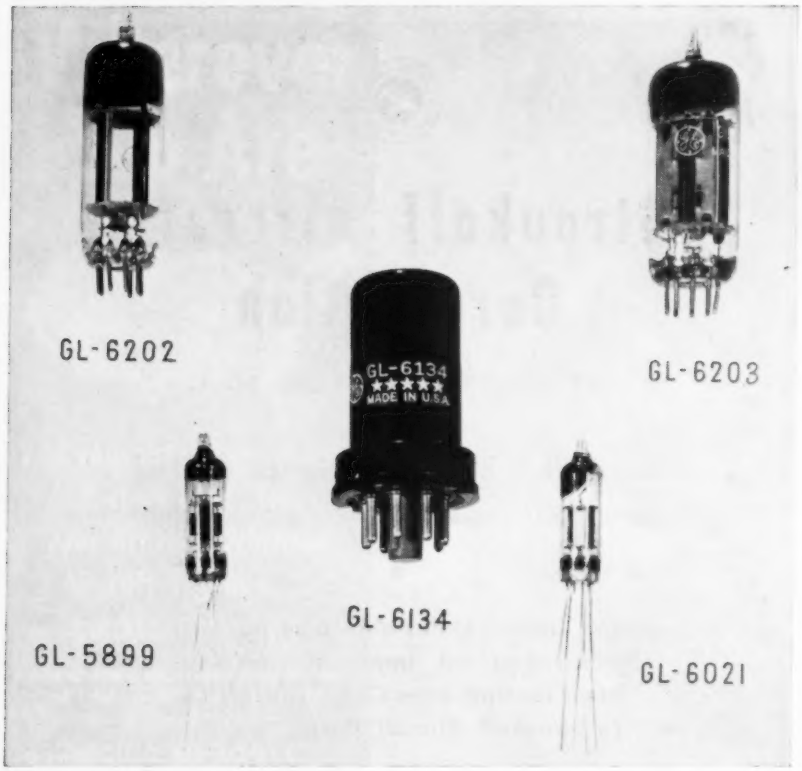
• DAMPING GENERATOR

Model: 420-400
Mfr.: Kearfott Co., Inc.
Weight: 7.6 oz.
Size: L-3", Dia.-1.062"
General: Consists of two phase servo motor and integral damping generator. Operates from 115 volts, 400 cps, single phase, a-c current or 57.5 volt 400 cps. Draws 3.5 watts. Motor output 0.63 in.-oz. Stall torque, no-load speed 5600 rpm. Generator output 0.480/1000 rpm. 16



• GEARED SERVO MOTOR

Model: R-303
Mfr.: Kearfott Co., Inc.
Weight: 5.5 oz.
Size: L-2 13/32", Dia.-1.062"
General: An adaptation of the R-119 servo motor with high torque to inertia ratio. Provides reductions between 10:1 and 100:1. Operates from 115 volts, 400 cps, a-c at .053 amps; no-load speed 62 rpm, stall torque 45 in.-oz. 17

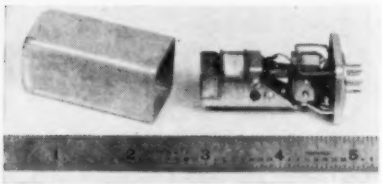


• IMPROVED TUBES

Models: GL-5899, GL-6021, GL-6134, GL-6202, GL-6203

Mfr.: General Electric Co.

General: GL-5899 is a subminiature, semi-remote cut off pentode for wide band, high frequency amplifiers, suitable for automatic gain control. GL-6021 is a general purpose medium-mu twin triode with electrically independent cathode for each section. Rugged construction. GL-6134—a sharp cut-off pentode for wide band RF, or intermediate-frequency amplifier. Replacements for 6AC7. GL-6202—a miniature full wave high vacuum rectifier for d-c power supplies where d-c requirements do not exceed 50 milliamps. Usable to 60,000 ft. altitude and 700 G peak impact acceleration. GL-6203—miniature full wave high-vacuum rectifier intended for use in power supplies of a-c and storage battery-operated equipment. Usable to 60,000 ft. altitude and 700 G peak impact acceleration. 18



• CHOPPER

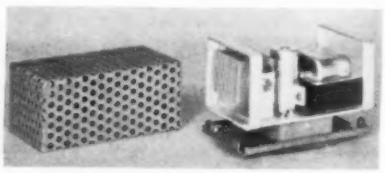
Model: SG6A

Mfr.: Minneapolis-Honeywell Reg. Co.

Weight: 2 oz.

Size: L-15/16", W-15/16", H-2-1/16"

General: Two single-pole, single-throw contacts operating alternately to modulate d-c input to a-c amplifier with on-off time adjustable. Contacts rated at 1½ volts, 1 MA average life 1000 hours. 19



• POWER SUPPLY

Model: MP-100 AC

Mfr.: Bendix Radio, Div. of Bendix Aviation Corp.

Weight: 2.0 lbs.

Size: L—4-11/16", W—2-27/32", H—3-7/16"

General: Operating from 115 volt, 400 cps, a-c current the MP-100 a-c power supply has a rated output of 250 volts at 60 milli-amperes. It is directly interchangeable with dynamotor power supplies in Bendix MN-53, MN-55, and MN-61 series marker receivers. 20

• REFERENCE GYRO

Model: 72

Mfg.: Summers Gyroscope Co.

Weight: 3½ lbs.

Size: Height 5 41/64", Dia. 3¼".

General: Operating on 24-30 volts and drawing 0.4 amps direct current, the Model 72 reference gyro is a 2-degree-of-freedom gyro which measures displacements about two axes by means of a potentiometer pickoff about each gimbal axis. Electrically caged and uncaged. Drift rate does not exceed ½°/minute. Designed to withstand 30 G acceleration. 21

• QUARTZ CRYSTAL

Model: 18

Mfr.: Aeronautical Electronics, Inc.

Weight: Under 1 oz.

Size: L-¾", W-¼", H-¾"

General: Covers a frequency range of 5 to 50 megacycles. Provides precise frequency control without heaters or ovens for operation from minus 55° to plus 90° C. Sealed in helium, immune to vibration, shock, and moisture. 22

• MAGNETIC AMPLIFIER REGULATOR

Model: AVR-22

Mfg.: Westinghouse Electric Corp.

General: The model AVR-22 a-c control panel is for isolated alternator and parallel systems and incorporates under-frequency relay, under- and over-excitation protection, differential protection, both short and long feeder, and is independent of external electrical power. 23

ONE OF A SERIES

You Get Many Benefits by Specifying VICKERS Hydraulics

Research | that means improved oil hydraulic equipment

The list of pioneering developments in hydraulics contributed by Vickers research is long and impressive. Among the most important are:

Hydrostatic Relief Valve • Commercial Power Steering • Balanced Vane Type Pump • Flow Control Compensator • Axial Piston Pump and Motor

These are fundamental developments that have been of vital importance in the progress of hydraulics. They are representative of a large line of equipment that, with Vickers experienced application, assures you the best in any type of hydraulic operation.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Servicing UAT Comet
at Le Bourget, France

Faster Service for the JET TRANSPORT ERA!

The Hydrant Refueling System, pioneered and developed by Esso, is the answer to the safe and speedy refueling demands of modern air carriers.

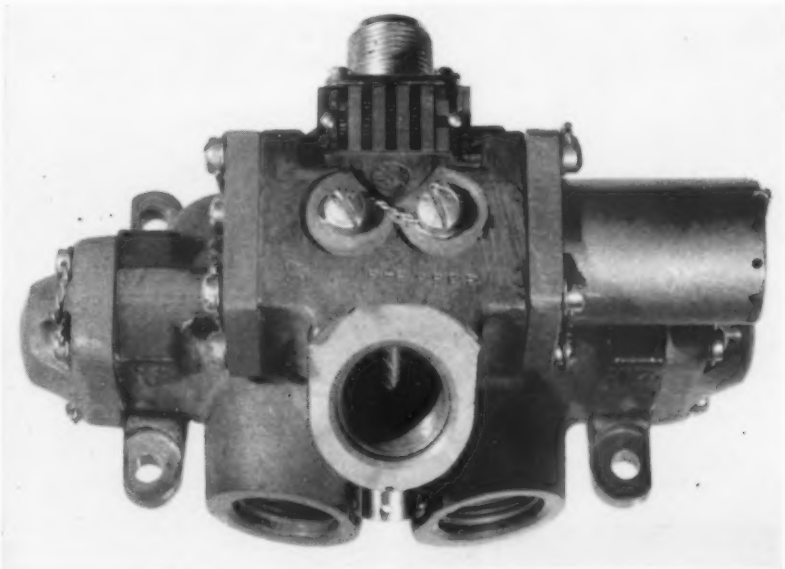
In the past, one refueling truck with a capacity of up to 4,000 U. S. gallons could service most aircraft completely. Today, due to the expansion of commercial aviation, and to the increased fuel capacities of large trans-oceanic planes – especially jet transports like the de Havilland Comet – refueling with conventional mobile units is gradually being replaced by Esso Hydrant Refueling Systems at many major international airports.

By eliminating the need for several trucks to complete a single refueling operation, the Hydrant Refueling System automatically lessens traffic congestion at airport terminals. Furthermore, it has the great advantage of combining speedy servicing with *maximum safety* thus insuring rapid turn-around at all times, to all aircraft.

Just one more reason why:
of *all* the World's International Airlines
8 out of 10 use

Esso
AVIATION PRODUCTS

1953 ***The Golden Anniversary Year of Powered Flight***
ESSO Experience in Aviation Began with the Wright Brothers in 1903



• SOLENOID SELECTOR

Model: 28161

Mfg.: Adel Division, General Metals Corp.

Weight: 1.75 lbs.

Size: Length 5 17/32", Width 3 7/16", Heights 3 1/32"

General: The Adel 28161 is a two-position, solenoid operated four way hydraulic selector valve operating on 18-30 volts, d-c. Used to control variable area nozzle of a jet engine, it is designed for use in high ambient temperatures, ranging from minus 65° to plus 350° Fahrenheit. No packings or slide members. Range: 2000-3000 psi. **24**

• INDUCTION MOTOR

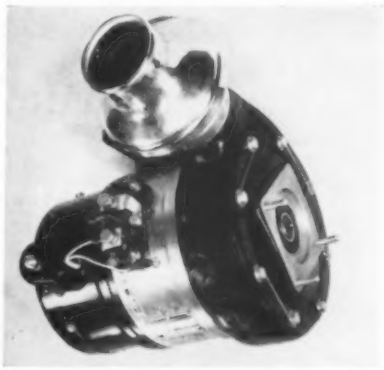
Model: 210002-010

Mfr.: Pesco Products Div.

Weight: 13.7 lbs.

Size: L-4-15/32", Dia. 7-5/16"

General: This high frequency induction motor is rated at 1.4 to 3.4 horsepower in the four pole model, 0.9 to 2.25 hp in six pole model, and 0.6 to 1.7 hp in the eight-pole version. Operates on 400 cycle, 115 or 200 volts, single or three phase current. **25**



• ELECTRIC MOTOR

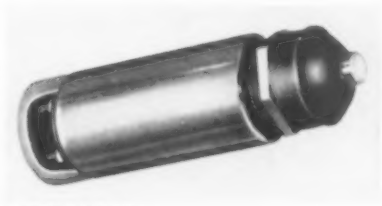
Model: DA-55-1

Mfr.: Jack & Heintz, Inc.

Weight: 56 lbs.

Size: L-12-5/32", Radius 5½"

General: Designed to supply power for the hose reel in "probe" and "drogue" in-flight refueling systems. The model DA-55-1 is rated at 9.5 hp continuous duty. It operates from 27 volt d-c power at 3600-3780 rpm at altitudes up to 25,000 ft. in temperatures ranging from —67° to 160° F. Current draw is 355 amperes and rated torque is 13.8 lb. ft. **26**



• SOLENOID

Model: 19760

Mfr.: Cannon Electric Co.

Weight: 9 oz.

Size: Dia. 1⅛"

General: A hermetically sealed solenoid for 28 volt d-c systems, the Cannon 19760 is designed for continuous duty operation and is suited for such applications as hydraulic and pneumatic valves. **27**

• SUPERCHARGER CONTROL VALVE

Model: 26153

Mfr.: Adel Div., General Metals Corp.

Weight: 1.9 lbs.

Size: L-6-15/32", W-7-7/32", H-3-37/64"

General: A solenoid operated engine oil pressure control valve, the Adel 26153 is currently used in the Pratt & Whitney R 4360 engine to direct oil flow from pressure supply to supercharger high blower. It operates from 20-30 volt d-c power source with an 0.5 ampere draw at 24 volts. Unit is self-contained and is vibration and corrosion free. **28**

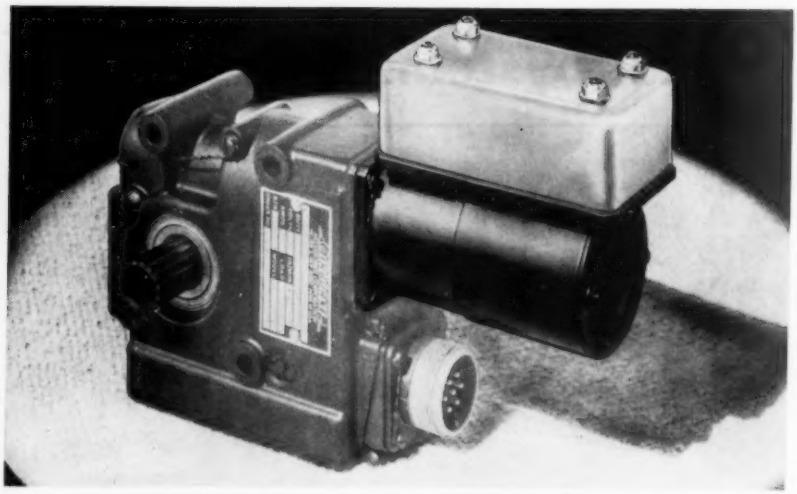
• ROTATING NAVIGATION LIGHT

Model: No. G-5790

Mfr.: Grimes Mfg. Co.

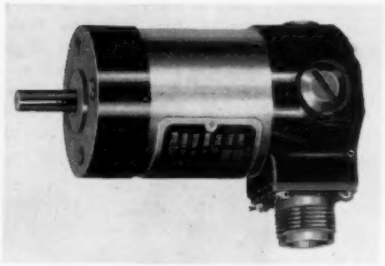
Weight: 2⅕ lbs.

General: Available for 28- and 13-volt operation, G-5790 uses a sealed beam 100 watt lamp, providing flashing beam of 4000 candle power. Supplements regular aircraft position and fuselage lights. Can be mounted on fuselage or, in case of larger aircraft, on vertical stabilizer. **29**



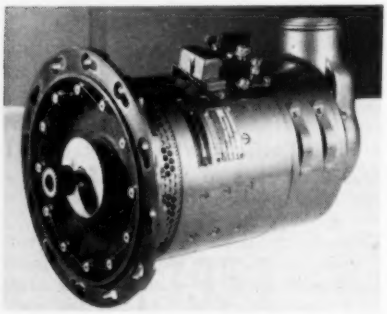
• CAPACITOR MOTOR

Model: E4160MI
Mfr.: Airborne Accessories Corp.
Weight: 21 oz.
Size: L-3½", W-1¾", H-3"
General: A capacitance induction motor operating on 115 volts, 400 cycles, single phase. Produces 1/30 hp @ 10,000 rpm. Features magnetic brake, is reversible, and has self-contained capacitor and thermal overload protection. 30



• HIGH ALTITUDE MOTOR

Model: 220013-010
Mfr.: Pesco Products Div., Borg-Warner Corp.
Weight: 1⅜ lbs.
Size: L-3⅞", Dia. 1¾"
General: Rated at 0.01 hp at 10,000 rpm to 0.045 at 9000 rpm operating from 27 volts d-c. Explosion resistant. 31

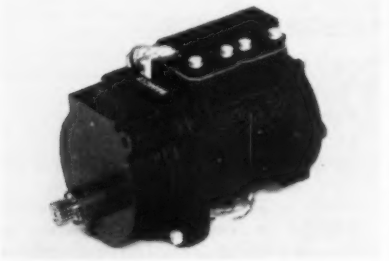


• 500 AMP GENERATOR

Model: G-50
Mfg.: Westinghouse Electric Corp.
General: This 30 volt, 500 amp generator has progressed beyond the laboratory stage. It is blast cooled and mechanical improvements have introduced high induced pressure drops across the generator. 32

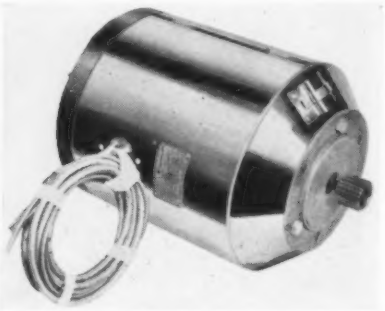
• A-C GENERATOR

Model: G-75
Mfr.: Jack & Heintz, Inc.
Weight: 39 lbs.
Size: L-12⅝", Radius 4½"
General: A water-cooled alternator using 3½ pounds of water per hour, the J&H Model G-75 operates at 12,000 rpm and output ratings are 12 KVA, three phase, 115 volt, 60 ampere, 400 cycle current. Moment about mounting is 230 in.-lbs. with pad designed according to Spec. AND 20002 type X11-E. 33



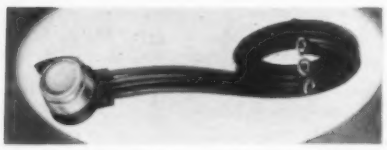
• ELECTRIC ACTUATOR

Model: MG-13
Mfr.: Minneapolis-Honeywell Regulator Co.
Weight: 1 lb., 14 oz.
Size: L-4⅞", W-2-9/16", H-3-15/64"
General: Operating from 240 volt, 2 phase, 400 cps or 115 volt, 400 cps current, the MH MG-13 actuator has an output of 1.4 in.-lb. stall and 1 in-lb. continuous. It is used to drive gauged potentiometers and digital counters. A velocity signal generator prevents hunting and unit is said to require no lubrication during first 1000 hours of operation. 34



• A-C GENERATOR

Model: 32298
Mfr.: AiResearch Manufacturing Co.
Weight: 4¾ oz.
General: Designed for guided missile use, the AiResearch a-c generator is rated for 50 G shock and 40 G acceleration. Uses no brushes. Output 800 watts, 115/200 volts, 3 phase, 400 cycles. 35

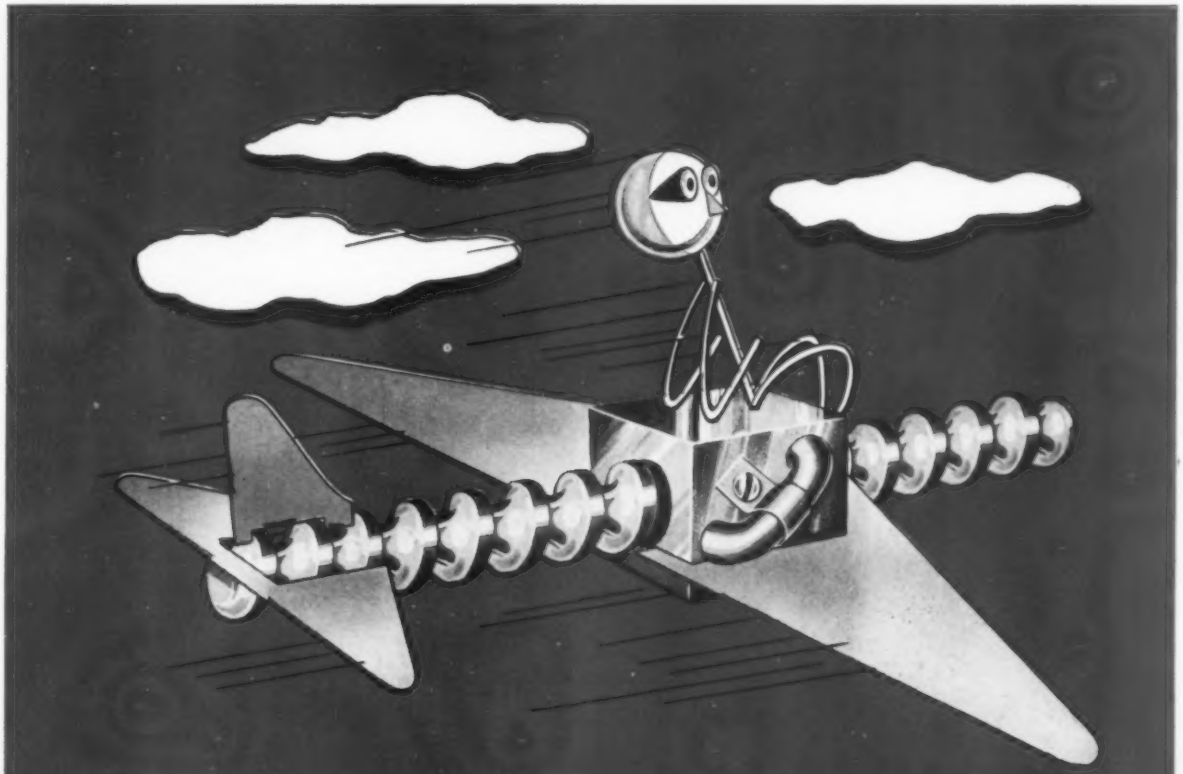


• THERMO SNAP CONTROL

Model: Klixon C-4391
Mfr.: Spencer Thermostat Div., Metals & Controls Corp.
Size: H-1⅛", Dia.-1¼"
General: A hermetically sealed snap action thermostat with silicone overmold for aircraft applications for settings as high as 400° F. Average ratings are 30 volts, d-c, 10 amperes; 125 volts, a-c, 10 amperes; 250 volts, a-c, 8 amperes. 36

• OVERHEAT WARNING THERMOSTAT

Model: 52B-594
Mfr.: Vapor Heating Corp.
Weight: 0.2 lbs.
Size: L-5½", W-1¼"
General: Used to control air or liquid temperatures in a range from 60° to 550° F. and to operate overheat warning devices. The Vapor Heating 52B-594 is accurate to an 0.3° change and operates from 20 to 30 volts d-c with a 5 ampere resistive load. 37

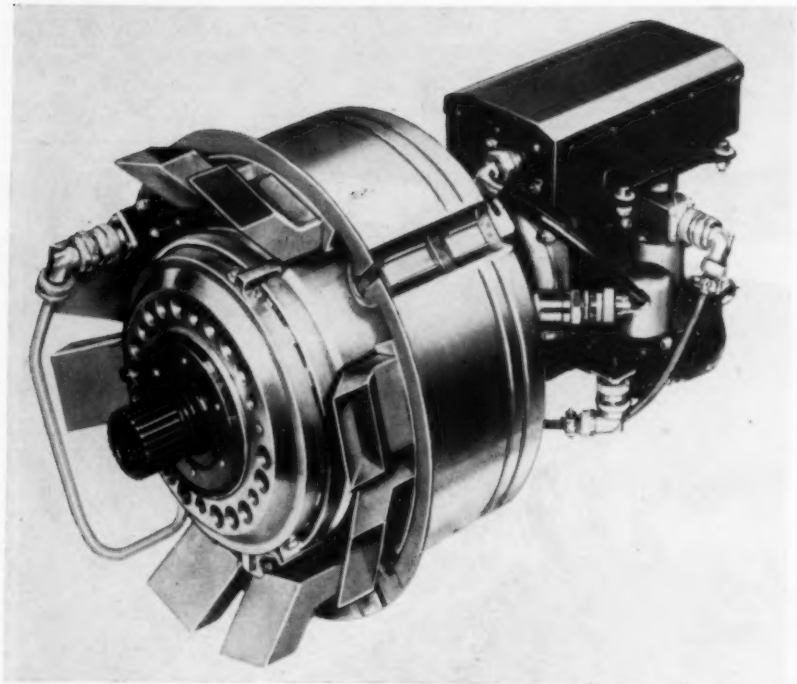


YOU'LL NEVER GO THIS FAR . . . BUT . . .

FOR MECHANICAL ACTUATION SAGINAW BALL BEARING SCREWS PROVIDE THE ULTIMATE IN EFFICIENT, DEPENDABLE OPERATION Saginaw Ball Bearing Screws are tried and proven as the most dependable method of actuating wing flaps, landing gears, trim tabs, stabilizers, etc. in America's latest planes. Can be combined with electrical, hydraulic or pneumatic units. Write for our Engineering Data Book.

Saginaw STEERING GEAR DIVISION

GENERAL MOTORS CORPORATION, SAGINAW, MICHIGAN • MANUFACTURERS OF SAGINAW POWER STEERING



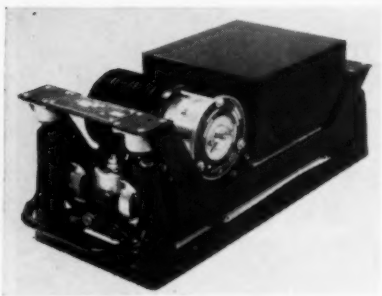
• COMBUSTION STARTER

Model: 36E23

Mfr.: Eclipse-Pioneer Div., Bendix Aviation Corp.

Weight: 75 lbs.

General: Turbine type jet engine starter which burns mixture of high pressure air and jet fuel. Develops 340 hp in 3½ seconds. Permits airborne starting of large jet engines. **38**



• GENERATOR CONTROL PANEL

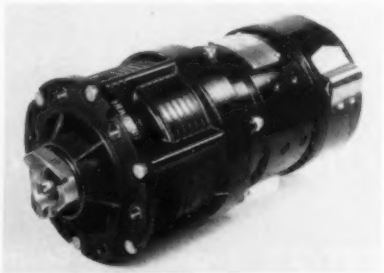
Model: GC-34-2

Mfr.: Jack & Heintz, Inc.

Weight: 11¾ lbs.

Size: L-16-15/32", W-6⅜", H-6-11/16"

General: Containing as many of the components of a 28 volt d-c electrical system as possible, the J&H GC34-2 control panel uses a lightweight, self-aligning polarized rack with an inject-eject mechanism for fast installation and removal. Unit includes a J&H GR-28 carbon pile voltage regulator, field relay, overvoltage protection, ground fault protection, a differential voltage coil, differential voltage provisions and reverse current protection. Other features are generator polarity reversal protection, an equalizer relay and a paralleling coil to provide load division within plus or minus 10% throughout the rated generator speed. Voltmeter and pre-flight test jacks are provided. **39**



• ENGINE STARTER

Models: JH6CE, JH6CF, JH6CP

Mfr.: Jack & Heintz, Inc.

Weight: 26¾ lbs., 26 lbs., 25½ lbs.

Size: L-11½"

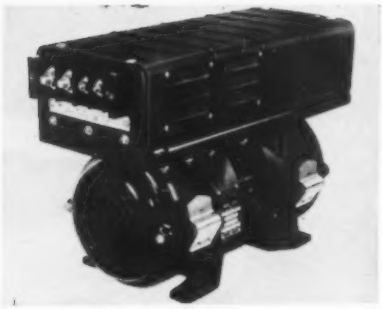
General: New commercial airline piston engine starters, the J&H JH6C series are adapted to engines of 2650-3500 cu. in. displacement (models JH6CE and JH6CP) and 1000-2650 cu. in. (model JH6CF). All operate from 28 volt, d-c power source and use a right-hand rotation, with left-hand rotation optional. **40**

• INVERTER

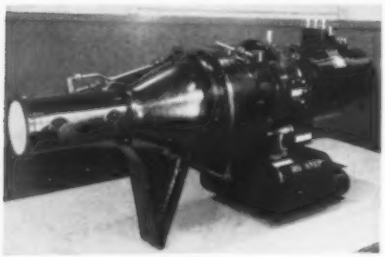
Model: F137

Mfr.: Jack & Heintz, Inc.

General: Now undergoing flight testing, the J&H model F137 has completed Air Force altitude cycling tests for 50,000 ft. operation. It is a 115 volt, 400 cps, single phase unit with a 1500 va output at 50,000 ft. and 20° C. ambient temperature, and uses a new J&H FRS regulator which combines the functions of governor and speed regulator. **41**



Jack and Heintz inverter.



• TURBO-GENERATOR DRIVE

Model: 7T-AD-10B

Mfr.: General Electric Co.

Weight: 237 lbs.

Size: L-38⅖", W-16⅖", H-22"

General: Operating off compressed air bled from the engine, the turbo-generator drive is a constant-speed unit of 60 KVA normal capacity, 120 KVA overload. Self-contained lubrication, control and cooling. Ratings applicable from idle to full engine power. **42**

• JET ENGINE THERMOCOUPLE

Models: 20, 21

Mfr.: General Electric Co.

Size: L-13½", W-9/32"

General: Used in late model GE J47 engines, the model 20 and 21 thermocouples operate in the temperature range of 1200° to 1900° F. and provide the temperature change signals to an electronic control which regulates fuel flow to the engine. **43**

Setting new jet records for speed and stamina

One after another, Strategic Air Command bomber wings are being equipped with the record-setting Boeing B-47 Stratojet. This fighter-fast, six-jet bomber is already standard equipment at several SAC bases.

The Stratojet's revolutionary design and construction endow it with performance entirely new to aircraft of its dimensions.

A B-47, for example, broke all distance and endurance records for jet aircraft when it completed a 12,000-mile nonstop flight. Refueled in the air three times from a Boeing tanker plane, this Stratojet remained in the air for 24 hours, simulating a strategic mission by dropping a dummy 5-ton bomb at the halfway point.

Another B-47 flew the equivalent of nearly 17 times around the world during an accelerated 1,000-hour service test. Approximately half the missions were flown at night. During one flight, the Stratojet, aided by high-level winds, sustained ground speeds as high as 794 miles an hour, and flew from Chicago to New York in 65 minutes.

This summer, 45 Stratojets of the 306th Medium Bomb Wing made the first nonstop mass jet bomber crossing of the Atlantic. They took off at intervals from Limestone Air Force Base, Maine, landing less than six hours later in England. More recently, a B-47 made the same crossing in 4 hours, 45 minutes, averaging 617 miles an hour.

These records give some measure of the performance potential that's built into the Boeing B-47. It's the result of imaginative engineering, forward-looking research, and expert construction. The B-47, and the larger eight-jet B-52 Stratofortress, are "writing the book" of performance standards for multi-jet aircraft. They are another demonstration of the integrity of Boeing research, design, engineering and production.

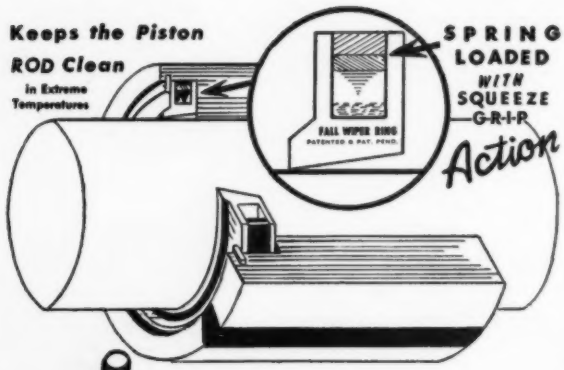
Boeing is now building a prototype jet transport, designed to be adaptable for either military or commercial use. The new plane has the benefit of Boeing's unparalleled experience in multi-jet aircraft. It will fly in 1954.

BOEING

The Fall Wiper Ring

Keeps The Piston Rod Clean!

Since 1944—Spring-Loaded with "Squeeze Grip Action" and (dry) Lapped True Circle



Used During World War II and ever since by the Military

Fall Wiper Rings Spec. MIL-S-5049 are AN Approved.

Squeeze Grip Action Does It

The 3-piece Fall Wiper Ring assembled into one piece as covered by patents consists of (1) a one-piece Split Wiper Ring (body) with two flanges or groove in its O.D.; (2) a one-piece split compressor spring assembled in the groove (3) an endless cover band surrounding the spring in the groove which causes a squeeze grip action on the piston rod.

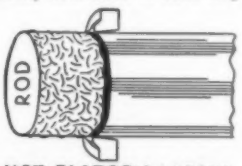
The Fall Wiper Ring is available from ½" to 13" dia. Military part numbers from AN6231A1 to AN6231A71. Write, wire or phone us regarding your wiper needs.

Exclusive Spring-Loaded "Squeeze Grip Action"—

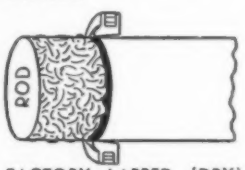
1. Eliminates spotty or erratic contact on rod.
2. Provides longer life because the spring in the "Squeeze Grip" takes up all wear, while the light-tight wiping edge continues to grip the rod.
3. The Spring Loaded "Squeeze Grip" Action on the rod is exactly the same for any number of rings of a given size because the pounds of **breakout friction** is individually controlled in each ring.

Exclusive Factory Lapped (dry) by Pre-Actuating

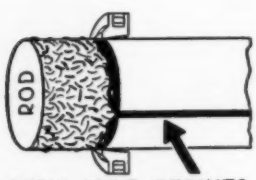
In addition to complying with Spec. MIL-S-5049, we create a **worn-in** true circle contact on piston by carefully pre-actuating each ring. This is done to avoid a wearing-in period after the ring has been installed . . . a period during which the ring might not completely contact the piston with the possibility that small metal fragments would wear off and enter the packing gland. This pre-actuating process is used by us exclusively and insures **immediate true circle contact,** from moment of installation. Only when the Spring Loaded "Squeeze Grip" action and Factory Lapped (dry) features are combined can full wiper contact and a light-tight wiping edge be assured. (See Illustration above, right.) This full wiper contact is long-lived because the spring in the "Squeeze Grip" action takes up the wear while the light-tight wiping edge continues to grip the rod.



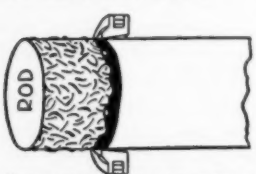
NOT FACTORY LAPPED (DRY) - LEAVES DIRT ON ROD



FACTORY LAPPED (DRY) WITH "SQUEEZE GRIP" ACTION ON ROD—STOPS PASSAGE OF DIRT (except at Joint)



OPEN JOINT PERMITS A STREAK OF DIRT AT JOINT OPENING



"CJ" WIPER'S CLOSED JOINT KEEPS THE ENTIRE ROD CLEAN

The FALL "CJ" Closed Joint Wiper Ring

Another First for FALL Wiper Rings! The FALL "CJ" Closed Joint Ring has been especially designed for those applications requiring absolute freedom from dirt passing through joint of ring to bearings or packing. (See illustrations at left.) This FALL Closed Joint ring has the same Spring Loaded "Squeeze Grip" Action and Factory Lapped (dry) wiping edge as our regular 3-piece "3C" type ring and functions exactly the same BUT with the added assurance that NO dirt passes through the joint. Patented and other patents pending.

FALL "3C" three-piece Wiper Rings are available in all sizes to including 13" diameter. FALL "CJ" Closed joint Wiper Rings are available in certain sizes now, other sizes soon. Our engineering staff will gladly work with you in solving your wiper ring problems. Write, wire or phone us.

Ace Products Company

P.O. Box 784 Toledo 1, Ohio Phone ADams 6513

All Fall Wiper Rings are covered by patents issued and patents pending.

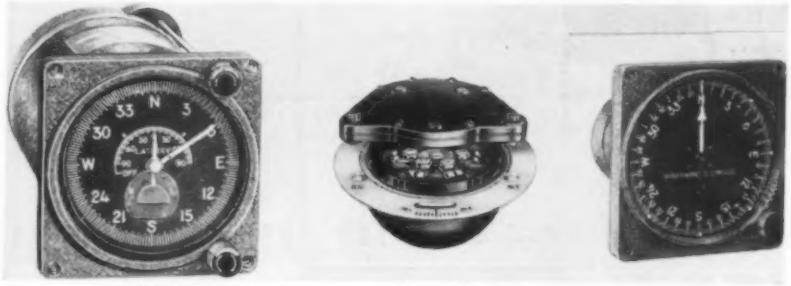
Fall Wiper Ring SPRING LOADED

• POLARPATH COMPASS

Model: 17200, 17300
Mfr.: Bendix Radio, Div. of Bendix Aviation Corp.
Weight: Directional Gyro Transmitter 7 lbs., Control Box 3 lbs.
General: Used to provide reliable directional reference independent of magnetic fields, the Bendix Polarpath Compass system consists of a type 17200 directional gyro transmitter and 17300 control box. System is designed for operation at any latitude when used with grid system of navigation, particularly in polar regions where magnetic information is unsuitable for conventional instruments. 44

Altitude monitor.

change in 50,000 ft. Used for flight programming of manned aircraft and guided missiles. 46



Indicator. **Transmitter.** **Repeater.**

• ANGLE OF ATTACK/YAW INDICATOR

Model: 33560
Mfr.: AiResearch Manufacturing Co.
Weight: 5½ lbs.
General: Provides angle of attack, angle of yaw and Mach information for armament fire control systems. Also provides data for flight control, landing control and navigational system. 47

• COMPASS SYSTEM

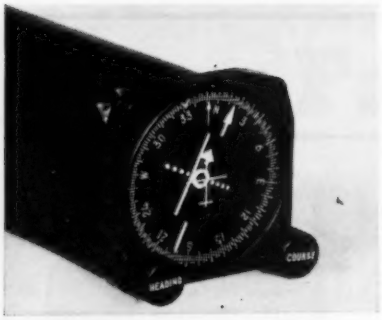
Model: N-1
Mfr.: Kearfott Co., Inc.
General: Designed for use in all latitudes regardless of magnetic field strength, the N-1 compass can be operated as a magnetic slaved compass or as a directional gyro. Also provides an azimuth reference signal for directional control for systems such as the autopilot. System includes magnetic sensing unit, hermetically sealed directional gyro, amplifier, master indicator, slaving controls, and repeater compasses. 45

• ALTITUDE MONITOR

Model: 1773B-02
Mfr.: Kollsman Instrument Corp.
Weight: 1 lb. 1 oz.
Size: L-3⅞", W-3⅞", H-2 7/16"
General: Operating from 26 volt, 400 cps current, the Kollsman altitude monitor combines a sensitive diaphragm mechanism and inductive pick-off responding to less than one foot of altitude

• VOR COURSE CHECKER

Model: H-16
Mfr.: Aircraft Radio Corp.
Weight: 11.7 lbs.
Size: L—10½", W—15-3/8", H—6¼"
General: Used to check phase accuracy of VOR signal generators, the Aircraft Radio Corp. standard course checker operates from 115 volt 60 cps power source. It checks 0° "To" (180° "From"), 180° "To" (0° "From"), and 15° "To" (195° "From"). A built-in self-checking circuit permits accuracy of measurement to be verified in a few seconds. Accuracy is plus or minus 0.1° between 15° C. and 30° C. when deviation indicated is within plus or minus 1°. 48

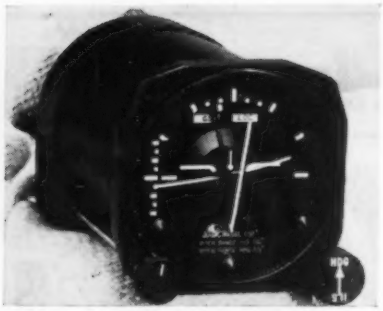


• INTEGRATED FLIGHT SYSTEM

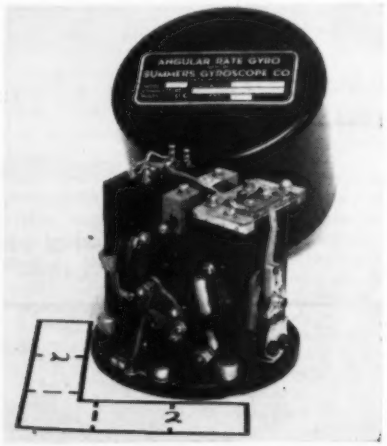
Model: FD-103
Mfr.: Collins Radio Co.
Weight: 29.3 lbs. complete
General: The Collins system combines a course indicator, approach horizon, vertical gyro, and steering computer to provide precise information to pilot for en route navigation and instrument approaches. Use permits elimination of conventional directional gyro, horizon, cross pointer indicator and omni-bearing selector. 49

• RATE GYRO

Model: GG 13A
Mfr.: Minneapolis-Honeywell Regulator Co.
Weight: 2 lbs.
Size: L-5 1/32", W-2", H-4⅝"
General: Operating from 115 volt, 400 cps single phase current, the M-H rate gyro has a range up to 400°/sec. and features extremely low threshold, high maximum rate, and adjustable damping. 50

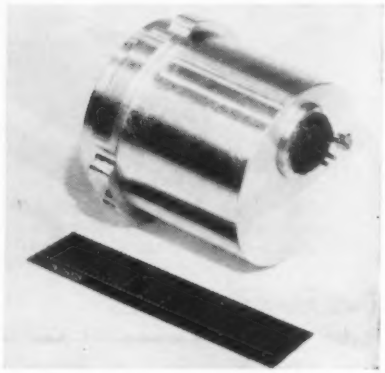


Collins Model FD-103.



• ANGULAR RATE GYRO

Model: 70
Mfr.: Summers Gyroscope Co.
Weight: 1¼ lbs.
Size: H-3 5/16", Dia.-3 9/16"
General: Used for stabilization control and telemetering on any axis, the Summers angular rate gyro accurately indicates angular rates for any maximum range of 10°/sec. to 100°/sec. Governor maintains speed of gyro motor and dashpot provides instrument damping. Potentiometer design corrects for about 75% of gimbal deflection error. 51



• RATE GYRO TRANSMITTER

Model: 15814-1-A
Mfr.: Eclipse Pioneer Div., Bendix Aviation Corp.
Weight: 13.5 oz.
Size: L-2", Dia. 2"
General: The Eclipse-Pioneer 15814-1-A rate gyro transmitter provides a signal proportional to rate of turn. Rotor moment has been maintained at the high value of 175 gram-cm². Pick-off design is intended to provide maximum signal output for a minimum gimbal displacement. 52

• GYRO-ROLL TRANSMITTER

Model: 14108-1-A

Mfr.: Eclipse-Pioneer Div., Bendix Aviation Corp.

Weight: 4.2 lbs.

Size: L-5 5/16", Dia. 3⅞"

General: Designed for missile applications providing precision and accuracy in 63 cubic inches displacement. Uses Autosyn synchro type take-off in outer gimbal axis; outer gimbal is completely free. Inner gimbal has ± 85° freedom. **53**

• LANDING SPEED INDICATOR

Model: LIS-4

Mfr.: Safe Flight Instrument Corp.

Weight: 3.98 lbs.

General: Gives direct "slow" or "fast" indication to pilot of landing airspeed, eliminating estimation of gross weight prior to landing and interpretation of its effect on best approach and landing speed. Operates from 12 or 24 volt d-c current and 0.4 ampere draw. **54**

• AIRSPEED COMPUTER

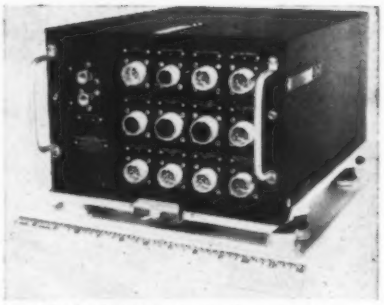
Model: 1904-02

Mfr.: Kollsman Instrument Corp.

Weight: 22 lbs.

Size: L-12⅛", W-12", H-8¼"

General: Operating on 115 volts, 400 cps current, the Kollsman C-2 true airspeed computer combines a differential pressure pick-up and a static pressure pick-up with an electro-mechanical computer mechanism. Serving as a central data source, the C-2 unit provides multiple outlets for

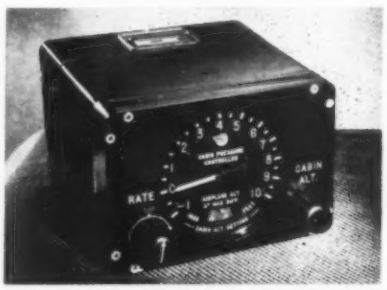


KOLLSMAN airspeed computer.

atmospheric pressure. Mach number, and true airspeed. These can be used to operate normal instruments plus serving as intelligence for navigation, bombing, fire control, etc. **55**

• FLIGHT RECORDER

Model: A
Mfr.: General Mills, Inc.
Weight: 16 lbs.
Size: L-14″, W-11½″, H-15″
General: Operating on 28 volt d-c, the Ryan flight recorder is a five channel unit providing 300 hours' recording of air speed, altitude, vertical acceleration time and heading. No electric circuitry. Will withstand 2000° F. without loss of record. **56**

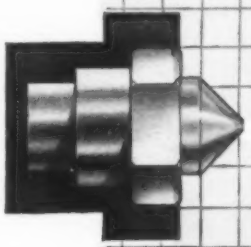


• CABIN PRESSURE CONTROLLER

Mfr.: AiResearch Manufacturing Corp.
Weight: Under 3 pounds.
General: Combines a cabin pressure selector, rate of change selector, and a differential pressure control in one unit mounted on pilot's instrument panel. Pilot may select cabin altitude between sea level and 10,000 feet at rates of pressure change between 100 and 2000 fpm. **57**

Yours for the asking: the *Janitrol Heating Digest*, a quarterly publication on aircraft heating and combustion problems . . . and *"Heat in Harness,"* a brochure giving a broad view of how the several Surface Combustion Corporation divisions work together in the advancement of combustion engineering.

IF FLAMES COULD BE 'FROZEN'



Janitrol

36 years experience in combustion engineering

If a flame pattern could be "frozen" at simple ambient conditions, and then methodically reproduced to perform under all flight conditions—life in the combustion engineering business would be a lot simpler. The fact is, of course, that theory gives out long before the perfect picture has been drawn.

And so . . . to achieve higher-than-ever combustion efficiency . . . to locate electrodes in just the right place for positive ignition . . . to develop new tricks (like sweat cooling) for elimination of hot spots . . . to produce controlled turbulence . . . to cut down resonance . . . in short, to get flame to conform to plan is a basic objective we reach through use of the large fund of flame facts we've built over the years. If you face any of these combustion problems, your Janitrol representative can quickly show how our facilities may fit into your program.

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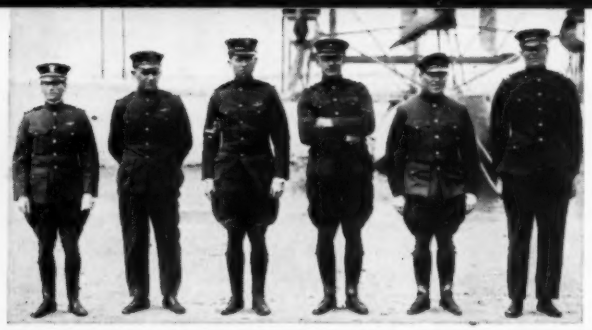

1919 U. S. Navy Flying Boat, Curtiss NC-4, made first transatlantic crossing under command of Lt. Cdr. A. C. Read. Trip depended upon Sperry Turn Indicator and Drift Set.

GLOBAL

a

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another Sperry first... 1919

Man tested his wings over the Atlantic for the first time May 16, 1919 when the U. S. Navy Flying Boat NC-4 began its historic 11-day trip to Lisbon. Aboard were Sperry instruments to aid in navigation – and Sperry instruments have played a vital role in global navigation ever since.

Since the Sperry Turn Indicator and Drift Set of that early flight have come the major navigational aids of our times – the Gyro-Horizon, Directional Gyro, Gyrosyn* Compass, Automatic Pilot, and Automatic Approach Control–electronic Sperry "brains" so precise and so dependable that global navigation today is largely routine. And yet, Sperry engineers are not satisfied. From Sperry developments now under way may soon come a new form of global navigation–navigation, which by comparison will dwarf Sperry's present achievements!

*T.M. REG. U.S. PAT. OFF.

1947 First "pushbutton" flight across the Atlantic by the USAF All-Weather Flying Division. Douglas C-54, with Sperry Gyropilot and Automatic Approach Control, made trip both ways including take-offs and landings without human hands touching the controls.

1924 First round-the-world flight by Army required 175 days. The two Douglas World Cruisers, Chicago and New Orleans, were each equipped with a Sperry Master Compass.

1932 First woman to fly the Atlantic solo was Amelia Earhart. Her Lockheed Vega was equipped with Sperry Gyro-Horizon and Directional Gyro and made the trip in 14 hours and 54 minutes.

1953 Air Force bombers, like the Boeing B-47B, depend on Sperry Bombing Navigational Computer to complete their global missions. Last year aboard commercial airliners other Sperry navigational equipment helped 2,362,000 trans-ocean passengers to reach their destination safely. You'll find Sperry too in the cockpits of the long-range jet transports of the future.

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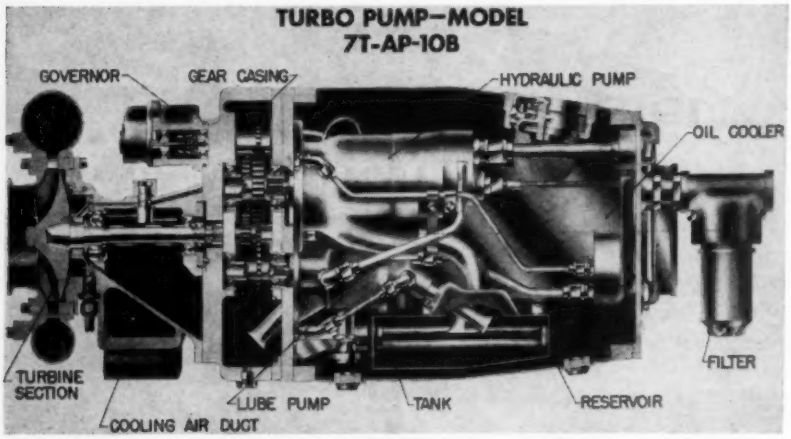
One of a series of advertisements commemorating the Fiftieth Anniversary of Powered Flight.

PROGRESS 50TH ANNIVERSARY OF POWERED FLIGHT SECURITY



• TURBO HYDRAULIC PUMP

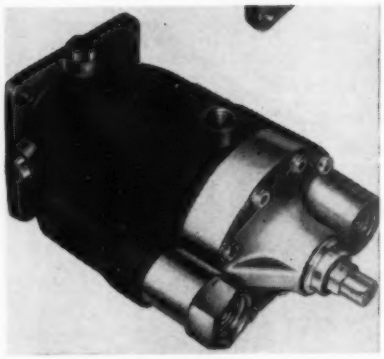
Model: 7T-AP-10B1

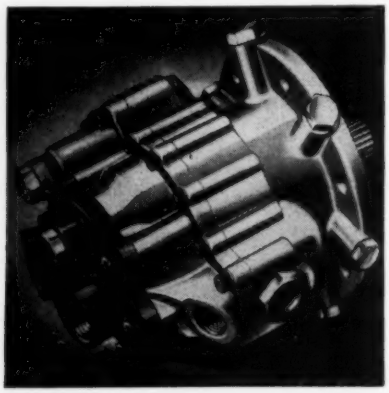
Mfr.: General Electric Co.

Weight: 95 lbs. dry

Size: L-35⅕", D-13½"

General: Air turbine driven, pump has 8 gpm capacity at 2700 psi over full range of air bleed conditions from engine idle to full power. It operates off turbojet compressor bleed air at 22 hp output. Features include self-contained control lube and cooling system; integrated hydraulic pump and reservoir. 58





• HYDRAULIC PUMP

Model: AP3V-16

Mfr.: Denison Engineering Co.

Weight: 12.7 lbs.

Size: L-6-13/16", D-6"

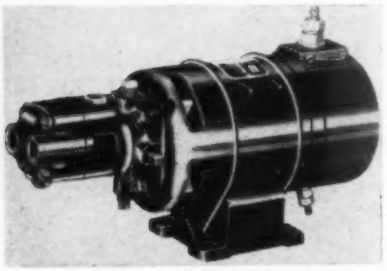
General: Pump is of variable volume type using engine drive. Utilizes 8 gpm at 3750 rpm creating 2500 psi. Flanges conform to AND specs 10261, 10262, and engine pads to AND specs 20001, 20002. 59

• HYDRAULIC PUMP

Model: 66 W

Mfr.: New York Air Brake Co.

General: One of series of aviation hydraulic pumps, 66 W has continuous working pressures to 3000 psi. New pump developments include positive return piston actuator, dual pressure pump with remote pilot controlled pressure oil regulation, and an electric control device for remote selective pressure control pump unloading. 60



• HYDRAULIC PUMP

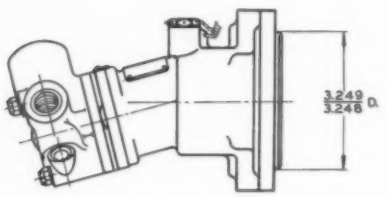
Model: 111001-010

Mfr.: Pesco Products Div., Borg-Warner Corp.

Weight: 12.5 lbs.

Size: L-10½", Motor dia.-4"

General: Electric-motor-driven pump provides continuous duty at 3000 psi. Operating with 27 volts d-c, it uses 50 amps. at 1500 psi and 75 amps. at 3000 psi. Capacity is 1 gpm with MIL-O-5606 oil. 61



• CONSTANT SPEED MOTOR

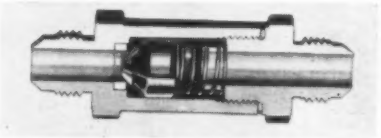
Model: MO-2 series

Mfr.: Vickers Inc.

Weight: 2.8 lbs.

Size: L-4-5/16", W-2½", H-2½"

General: Featuring adjustable automatic speed control, MO-2 series has 0.32 gpm capacity with 0.6 hp input. Control device is built into the valving head of the motor. Currently used in air compressor and cooling fan drives. 62



• CHECK VALVE

Model: K-1249

Mfr.: Kohler Co.

Weight: 0.3 lbs. to 1.0 lbs.

Sizes: -6 to -16

General: New 3000 psi hydraulic check valves conforming to Spec. AN 6249 for military and commercial aircraft. Size -6 has been released for production and -8, -10, -12, and -16 have approval pending. Capacities range from 3.5 gpm to 29.0 gpm. 63

• BOOST PUMP MOTOR

Model: 5B631RJ119A

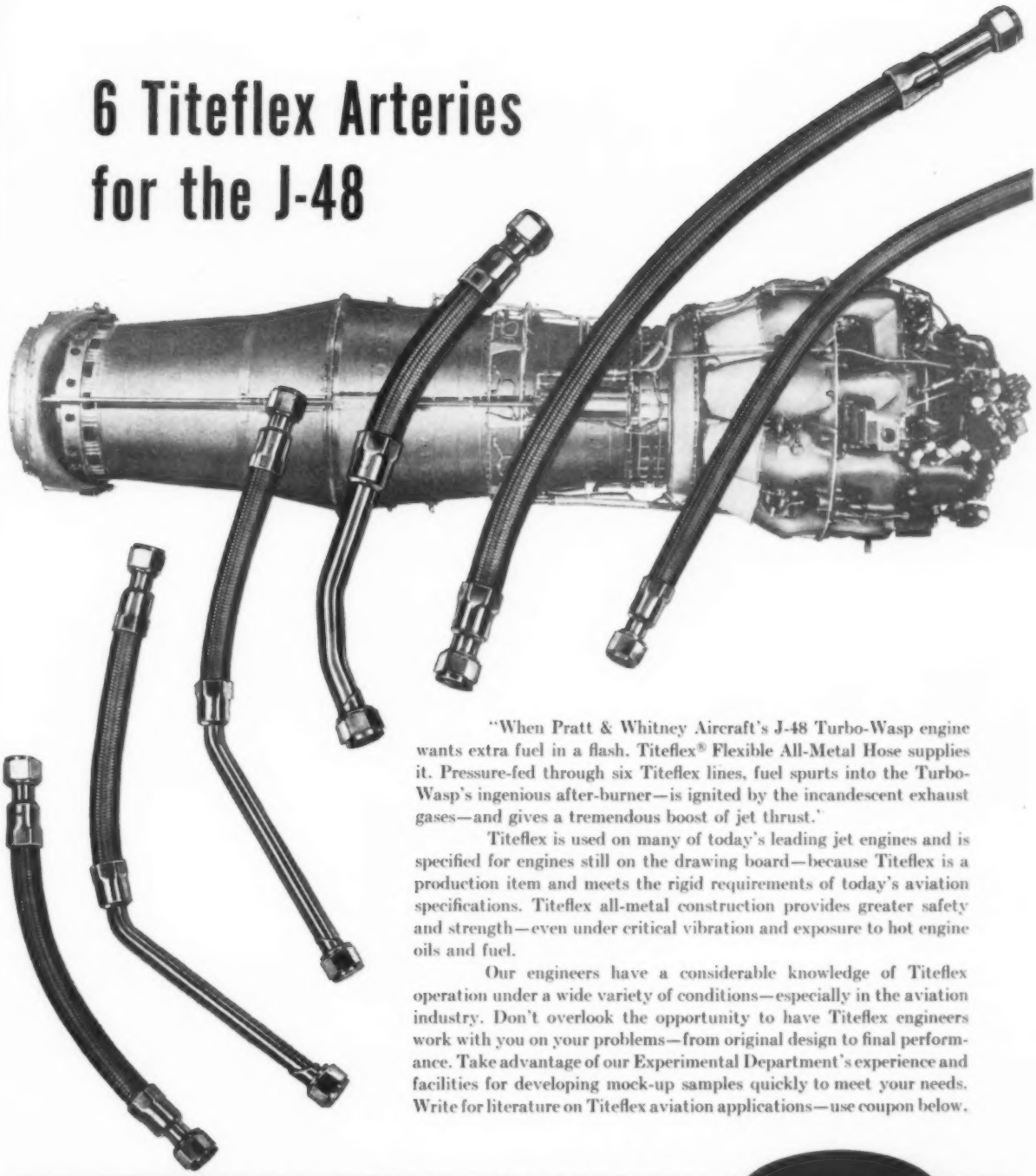
Mfr.: General Electric Company

Weight: 37 lbs.

Size: L-12" (approx.), H-8½", Dia.-5½"

General: Operates on 27 volts d-c producing 3½ hp at 2500 rpm. Speed range 2250 to 3700 rpm. Motor geared through 3:1 reduction. Explosion-proof ducted motor providing air cooling. Has noise filter. 64

6 Titeflex Arteries for the J-48



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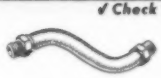

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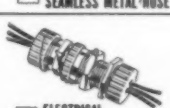

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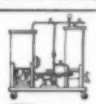

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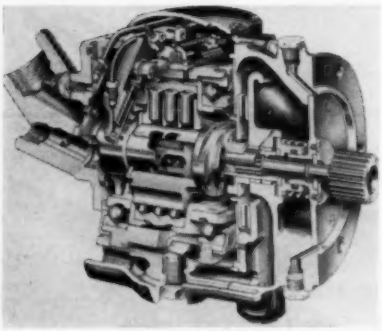


• HYDROMATIC PUMP

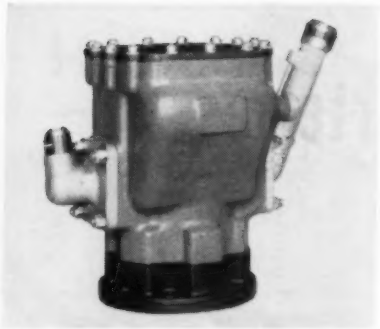
Model: V379-11

Mfr.: Hamilton Standard Div., United Aircraft Corp.

Weight: Under 20 lbs.

Size: L-9½", Dia. Under 9"

General: A variable displacement, high speed hydraulic pump primarily for power conversion. Uses 21 radial pistons of 0.875 cu. in. displacement per revolution. 1200 gph capacity. Pumping action variable from zero to full stroke using system pressure or other control devices. **65**



• VARIABLE DISPLACEMENT PUMP

Model: AS 48000

Mfr.: Vickers Inc.

Weight: 28 lbs.

Size: L-9½", W-11⅞", H-14"

General: Output 15 gpm @ 1500 rpm, 3000 psi. Largest known variable displacement aircraft hydraulic pump. Incorporates automatic flow control acting as speed control on driven end by limiting amount of oil delivered. Requires 27 horsepower at 3000 psi and 1500 rpm. Used on Douglas DC-7. **66**

• HIGH SPEED PUMP

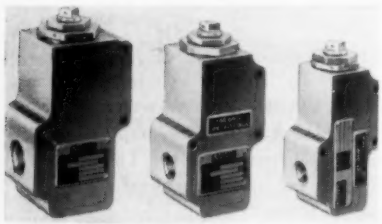
Model: 012549-010

Mfr.: Pesco Products, Div. Borg-Warner Corp.

Weight: 3 lbs.

Size: L-4½", Body dia.-3⅛"

General: Pressure-loaded positive displacement gear pump of 2.4 gpm at 3000 psi. Operates 12,250 rpm, maximum torque 3 pound-feet. Above model uses large mounting flange to adapt AND-200002 type XII-J drive. Lighter versions available. **67**



• RELIEF VALVES

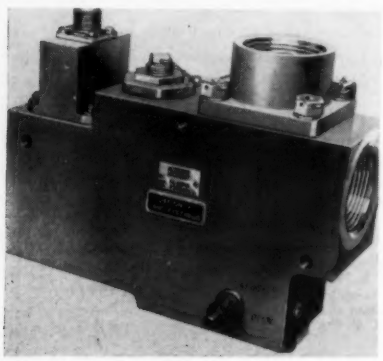
Model: AA 31300 Series

Mfr.: Vickers Inc.

Weight: ¾ to 3 lbs.

Size: L-4¼", W-2⅛", H-1-5/16"

General: Capacities ranging from 1.2 gpm to 16 gpm, adjustable to 4500 psi. Recently passed AN qualification tests. Feature external drain assuring stabilized valve setting and vent which permits external control of valve. **68**



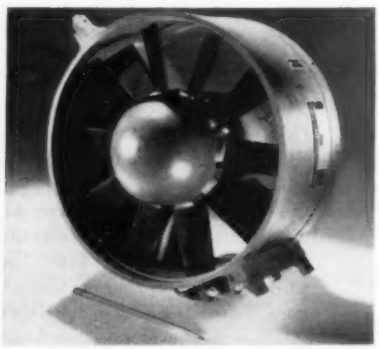
• PUMP CONTROL VALVE

Model: AA 40510

Mfr.: Vickers Inc.

Size: L-7⅞", W-2¼", H-3¾"

General: An adjustable control valve used to automatically unload pump delivery at a low pressure into the suction side when oil temperature is too high. Includes manual unload provisions and relief valve. Pressure actuated electric switch incorporated acts as firewall shut off. 18 gpm capacity. **69**



• RAM AIR TURBINE

Mfr.: AiResearch Mfg. Co.

Weight: 15 lbs.

Size: Dia. 12", less ¾" c.f.

General: Supplies emergency hydraulic power for jet aircraft. Can be installed in air duct or extended into air stream. Reaches full power Mach 1 in less than one second. At 130 knots full power in 3 seconds. Automatically controlled speed. **70**

• BLOWDOWN VALVE

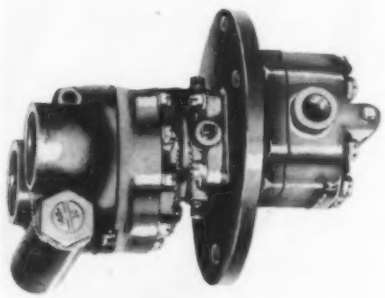
Model: 210B0100

Mfr.: The Cornelius Co.

Weight: 0.15 lbs.

Size: Length 3¾", Width 1", Height 2⅜".

General: The Cornelius blowdown valve automatically blows down moisture separator when compressor stops running. Keeps compressor from starting against pneumatic pressure. Designed to be installed in outlet of the compressor, it has a ¼" female hydraulic inlet port, and air outlet port. Vent port is ¼". Operates in 3000 psi pneumatic and hydraulic systems. **71**



• OIL TRANSFER PUMP

Model: 012634-010

Mfr.: Pesco Products Div., Borg-Warner Corp.

Weight: 11.3 lbs.

Size: Length: 9.15"; Dia. (across flange) 7.25"

General: This is a pressure-loaded variable-speed hydraulic pump incorporating relief valve and thermal protector. Pesco hydraulic motor-drive is integral part of package. Output is 3 gpm at 500 psi. Input requirement 7.8 gpm at 1350 psi maximum. Used on Lockheed Super Constellation. **72**

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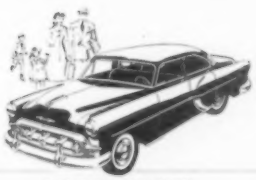

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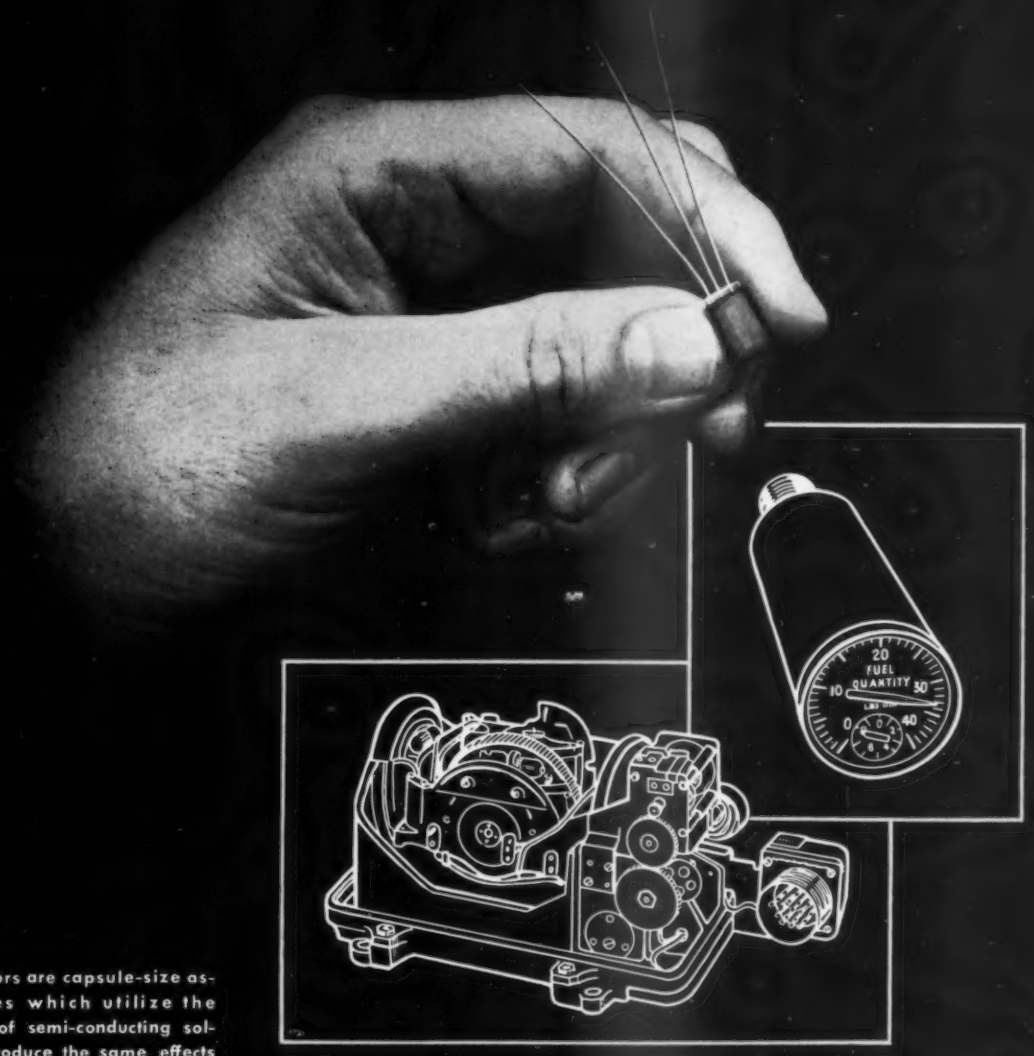
Transistors*

in aeronautical control...



*Transistors are capsule-size assemblies which utilize the physics of semi-conducting solids to produce the same effects as an electronic tube... but without cathode and/or filament and their circuitry components.

When ?

ONCE in a generation or more, there appears on the horizon an engineering accomplishment that becomes the object of wide discussion, enthusiastic comment and a great many predictions.

Such is the case with transistors today.

Anticipating Honeywell leadership, many aeronautical men have asked when our company will be announcing "transistorized" control.

Long before transistors started receiving public notice, Honeywell research groups in the Aeronautical Division and the Heat-Controls Division in Minneapolis and the Industrial Division in Philadelphia were experimenting with transistors. Honeywell management backed research with an investment in patent licenses with Bell Telephone Laboratories, the pioneers of transistors.

Remarkable results have already come out of this program. Today, we are proud to report the development and pilot line manufacture of transistors with sufficient power to operate control motors and to pull in relays . . . hermetically sealed transistors that should have infinite life

Yet, even with our extensive research and development programs, much work remains. Such problems as temperature and circuitry must be further explored before transistors can be incorporated into production-line equipment. Even with concentrated effort, thorough engineering takes time . . . and it's worth time.

Honeywell aeronautical controls using transistors will be on the market at as early a date as possible, but only after they have met airborne requirements and have been proved to be worthy of our slogan "First in Controls." It won't be today. But, it will be soon.

MINNEAPOLIS
Honeywell

Aeronautical Controls

For more information . .

Passenger & Crew Furnishings

. . see pages 5 and 6.

• PASSENGER SEAT

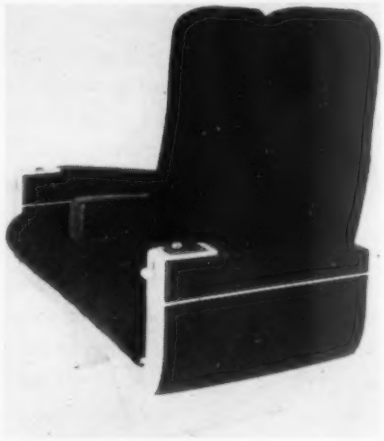
Models: 1710 (double), 1711 (triple)
Mfr.: Burns Aero Seat Co.
Weight: 1710: 56 lbs., 1711: 81 lbs.
Size: 1710: L-26.6", W-41", H-43.5"
1711: L-26.6", W-60", H-43.5"
General: The Burns models 1710 and 1711 seats are designed for use in aircoach interiors, with provisions for use in either the forward or aft-facing position with the same floor attach points. 73

• PASSENGER SEATS

Model: TE-316 LAV
Mfr.: Teco, Inc.
Weight: 28 lbs. per passenger place.
General: Standard seat, removable or collapsible to flush position. 74

• FOLDING SEAT

Model: 4012
Mfr.: Hardman Tool & Engineering Co.
General: Designed for Douglas DC-4 and DC-6 series aircraft, the Hardman model 4012 seat can be folded and stowed against the cabin sidewall when airplane is used for cargo operations. Approved for 6g forward deceleration loads. 75



• PASSENGER SEAT

Model: TE 314
Mfr.: Teco, Inc.
Weight: 25 lbs. per passenger place.
General: Standard seat manufactured in singles, doubles, and triples and used in DC-4's, DC-6's, L-749's, etc. 76

• CREW SEAT

Model: Aero-Crew 1221
Mfr.: Burns Aero Seat Co.
Weight: 48 lbs.
Size: L-22", W-24", H-32"
General: Model 1221 has been tested and certified for 20 G's. Full or partial elevation, variable height adjustments and arm-rests are optional. 77

• BERTHABLE SEAT

Model: 2D1-BST
Mfr.: Burns Aero Seat Co.
Weight: 128 lbs.
Size: W-25", H-39", berth 75" long.

BURNS berthable seat.

General: Burns model 2D1-BST is a berthable passenger seat designed for business aircraft. Swivels on base and has self-contained leg rest. 78

AEROTHERM model 41 passenger seat in normal position (above), and folded (below).

• PASSENGER SEAT

Model: 461
Mfr.: The Aerotherm Corp.
Weight: 47 lbs.
Size: L-27/36", W-44" and 46", H-40½"
General: First used in Trans-Canada's Vickers Viscounts, the Model 461 reclines to 45° with infinite positioning. Center arm folds between seats. Molded fibreglas back is used. Meets CAA's TSO-C25. 79

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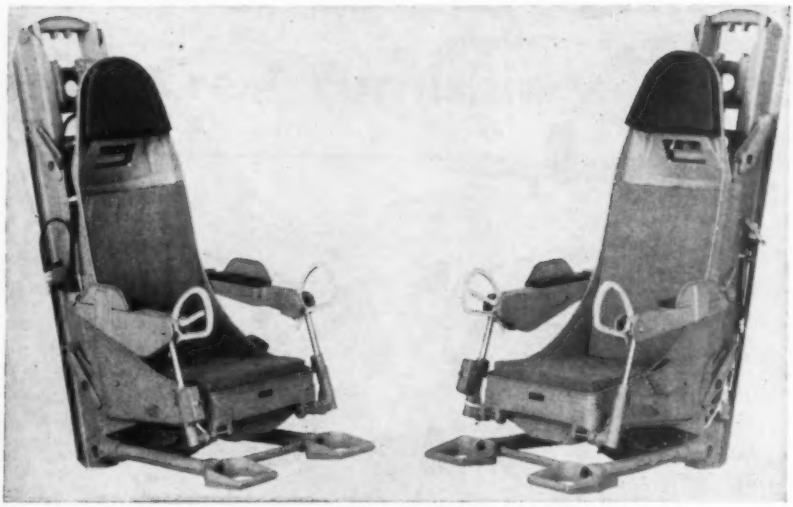


TWO VIEWS of Weber ejection seat for fighter pilots.

• EJECTION SEAT ASSEMBLY

Model: 74048

Mfr.: Weber Aircraft Corp.

General: Designed for 32 G's, Weber's Model 74048 ejection seat for fighter pilots meets specification MIL-S-6326. Except for special cockpit requirements, unilateral seat adjustment is obtained with electrical actuator. Ejectable from any adjusted position. 80

• HIGH DENSITY SEAT

Model: 3027

Mfr.: Hardman Tool & Engineering Co.

General: A 9G coach seat with standard de luxe arrangements except for narrow width. Manufactured in doubles and triples. Structure of the 3027 is of Chrome Moly. Seat is used in tourist configurations of Douglas DC-6B's and Lockheed Super Constellations. 82

• RADAR OPERATOR SEAT

Model: 615

Mfr.: Hardman Tool & Engineering Co.

Weight: Approx. 51 lbs.

General: Complying with CAR-4B requirements, seat is track mounted for backward and forward travel, has 360° swivel with 15° increment stops. It also reclines from 12° to 38° off vertical position. Other features include airfoam cushions padded with canvas, molded back, ear-type cushions and adjustable arm rests. 81

• RADIO & NAVIGATOR CHAIR

Model: 618

Mfr.: Hardman Tool & Engineering Co.

Weight: 43 lbs.

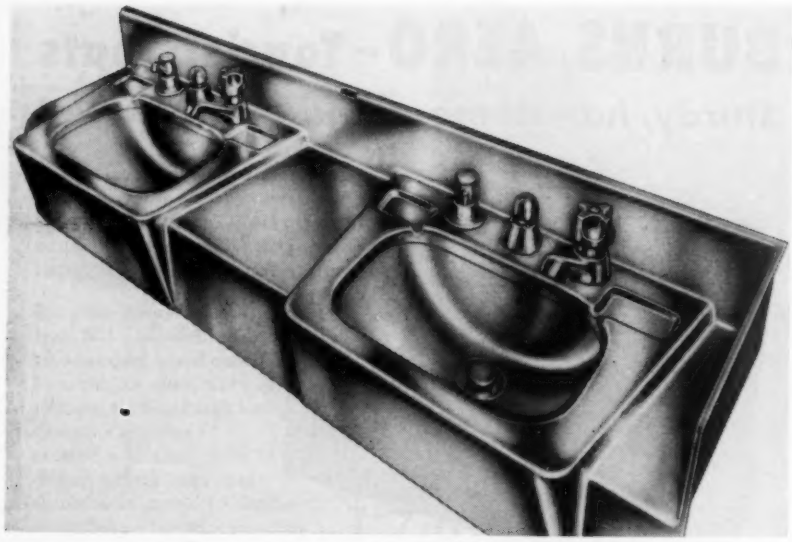
General: Seat is provided with ditching cable attachments which permit 20 G ditching load. Fore and aft movement accomplished by track mounting, permitting traverse movement in steps of 1.17″ for 7″. Full swivel features 45° stops with vertical travel to 5″ in steps of 1″. Retractable headrest and airfoam padding featured. 83

• CREW SEAT

Model: Aero-Crew 2500
Mfr.: Burns Aero Seat Co., Inc.
Weight: 12.5 lbs.
Size: L-20", W-19", H-32"
General: Multi-use auxiliary crew seat is track-mounted and has adjustable positioning. Armrests and headrests are available. 84

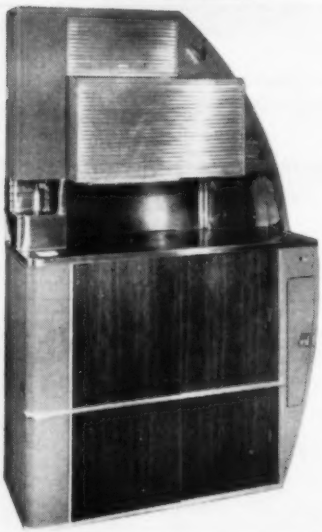
• CREW SEAT

Model: Aero-Crew 2150
Mfr.: Burns Aero Seat Co., Inc.
Weight: 27 lbs.
Size: L-23", W-23", H-46"
General: Type used initially on Lockheed 1049's; features of Aero-Crew 2150 include full swivel, track-mounted with variable position lock. Armrests and/or headrests are optional. 85



• WASH BASIN

Model: 73660
Mfr.: Weber Aircraft Corp.
Weight: 23 lbs.
Size: L-41⅜", W-12⅛"
General: A stainless steel double wash basin providing a liquid soap dispenser, razor blade disposal, and chromed control valves. 86



• BUFFET ASSEMBLY

Model: 73108-400
Mfr.: Weber Aircraft Corp.
Weight: 193 lbs. approx.
General: Designed for installation in Douglas DC-6 series aircraft, the Weber buffet is complete with water dispenser, refuse tank, and container. Lower structure uses walnut veneer sliding doors and upper structure "Slikeflex" polished aluminum doors. Unit features an electric control panel with indicator lights and a folding stainless steel counter top. Equipment includes electric hot cups, hot liquid containers, and hot food carriers. 87

• URINAL

Model: 14
Mfr.: Basco Metal Products, Inc.
Weight: 24 lbs.
Size: W-18", H-35½", D-9¾"
General: A 15 gallon urinal of stainless steel. 88

• DISTRESS SIGNAL

Models: K-1500 & KO-1500
Mfr.: Kilgore, Inc.
Weight: 13 oz.
Size: L-10", Dia. 1 1/16"
General: Available in either a 10,000 candlepower red light (model K-1500) or orange smoke candle for day warning (KO-1500). Both of minimum 30-second duration. 89

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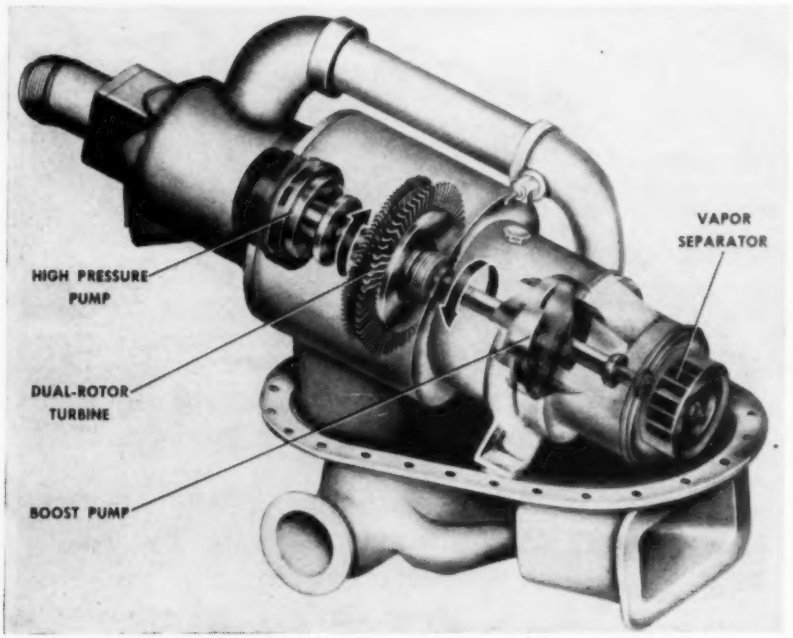
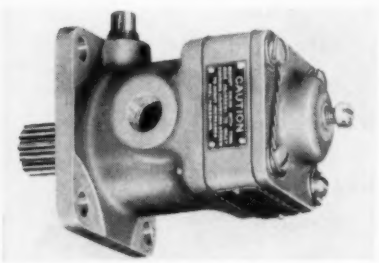


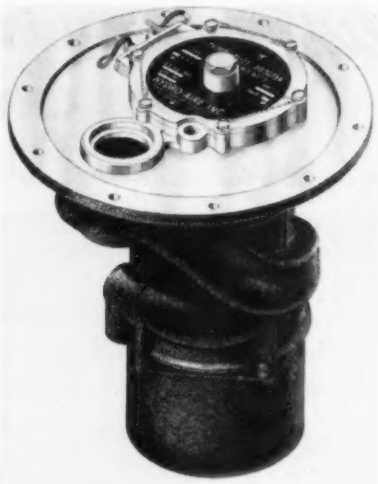
• AFTERBURNER FUEL PUMP

Model: TT-AP-11A5
Mfr.: General Electric Co.
Weight: 31 lbs.
Size: L—14-3/5", W—6-1/10", H—9-1/5"
General: Provides jet engine afterburner fuel at a flow rate of 86 gpm and 600 psi pressure. The GE TT-AP-11A5 is a pneumatically driven pump incorporating boost, vapor separation, and high pressure pumping elements in one package. It is designed to replace more complex systems which used a boost pump, afterburner pump and wiring in such aircraft as North American's F-86D Sabre. 90



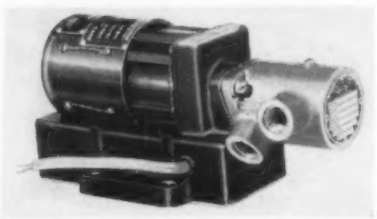
• FUEL PUMP

Model: RD-7420B
Mfr.: Lear, Inc., Romec Div.
Weight: 1 lb.
Size: L-3-19/32", W-2½", H-2-7/16"
General: A lightplane engine-driven fuel pump, the Romec RD-7420B has an output of 2 to 30 gph at 3700 rpm and discharge pressure of 15 psi. Balanced relief valve and by-pass valve are assembled on end of pump. 91



• FUEL BOOST PUMP

Model: 6555
Mfr.: Hydro-Aire, Inc.
Size: H-8 9/16"
General: A high-altitude fuel booster pump, the Hydro-Aire Model 6555 features a new type impeller designed to depress fuel vapor back into liquid. Operating with either aviation gasoline or jet fuels, the new pump has performed satisfactorily at 30° F. temperatures at altitudes up to 62,500 feet. 92

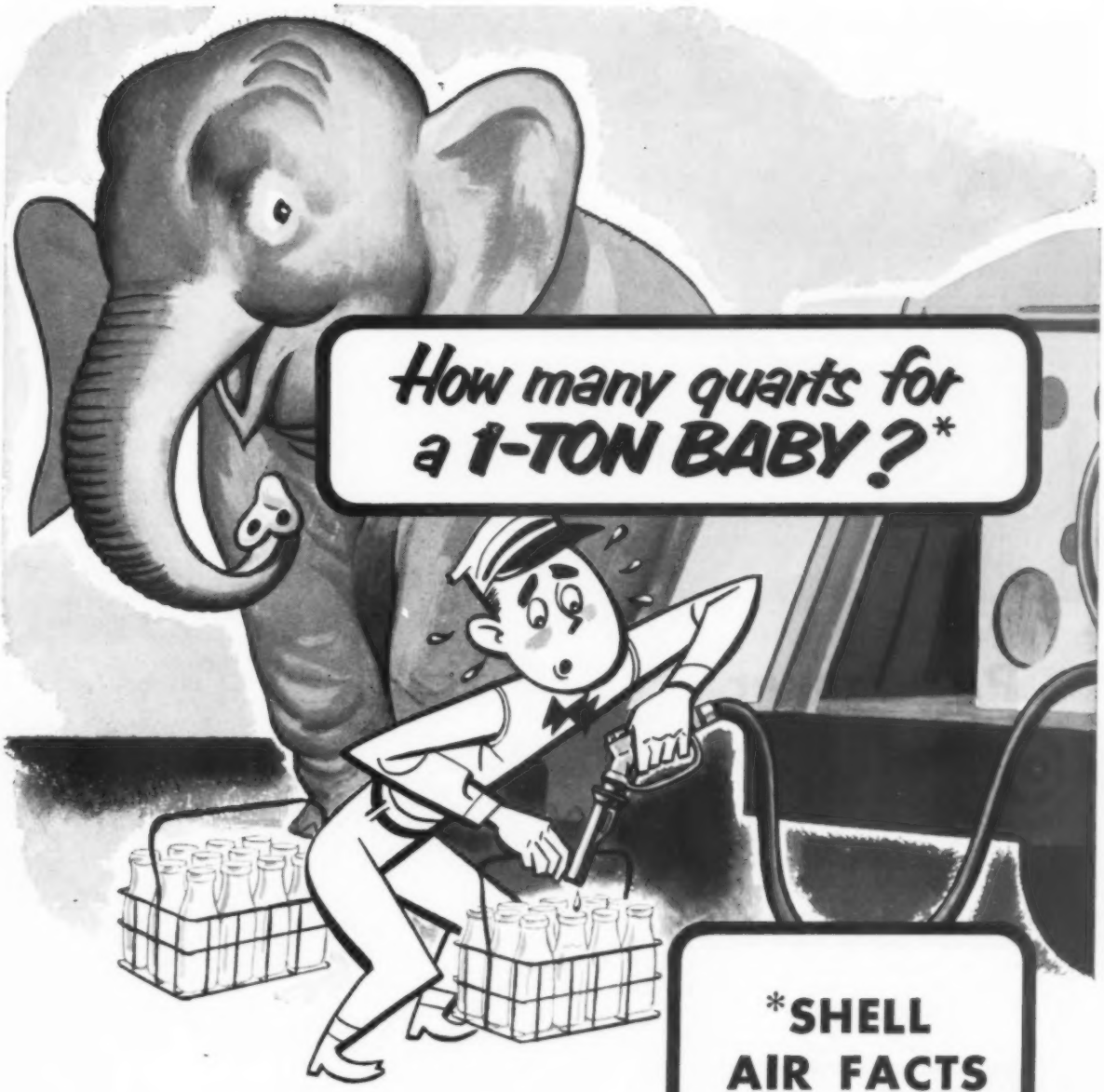


• FUEL SCAVENGE PUMP

Model: RG-9440
Mfr.: Lear, Inc., Romec Div.
Weight: 3.9 lbs.
Size: L-7-47/64", W-3-15/16", H-3-23/32"
General: Operating from 115 volt, single phase, 400 cps current, the Romec RG-9440 has a capacity of 150 gph at 5 psi discharge pressure and 400 rpm. Used in Boeing B-52 to remove all fuel from aircraft refueling manifold when refueling is completed. 93

• FUEL PUMP

Model: 2P-711-CE
Mfr.: Pesco Products Div., Borg Warner Corp.
Weight: 4.3 lbs.
Size: L-4-3/100"
General: An engine-driven, vane type fuel pump with a rated capacity of 700 gph and speed of 2500 rpm with pressure adjustable from 6-30 psi. Currently used with R-2800, R-3350, and R-4360 engines in Douglas DC-6, Convair 340, Lockheed 1049, and Boeing 377 airplanes. New models provide replaceable insert in rotor to facilitate overhaul. 91



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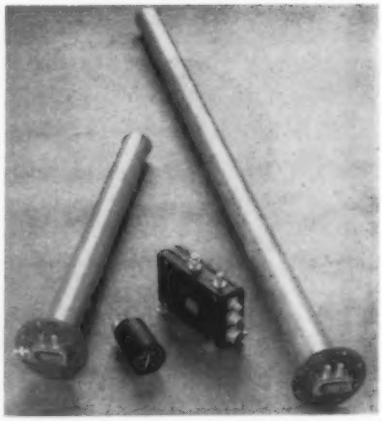


• FUEL QUANTITY INDICATOR

Model: Pacitron

Mfr.: Simmonds Aerocessories, Inc.

General: The new lightweight Simmonds Pacitron system features sensing probes fabricated of Fiberglas DAP material, a Simmonds development. Using interchangeable components, the system is used in the Lockheed Super Constellation, Chance Vought F7U-3 Cutlass, Sikorsky S-58 helicopter, and Vickers Viscount turboprop transport on order by Trans-Canada Air Lines. 95

• FUEL QUANTITY INDICATING SYSTEM

Model: 2-unit

Mfr.: Avien Engr. Div., Avien-Knickerbocker, Inc.

Weight: 1.85 lbs.

General: A capacitance type fuel gaging system, the new Avien two-unit system combines all intermediate units, such as bridge amplifiers, within the indicator case, providing a 50% reduction in weight and using 158 fewer parts than in the former three-unit system. Design permits direct interchangeability of indicator cases for a particular type airplane. 96

• MASS FLOWMETER

Model: DJ-64 Indicator; TJ-50 Transmitter; TJ-49 Power Supply

Mfr.: General Electric Co.

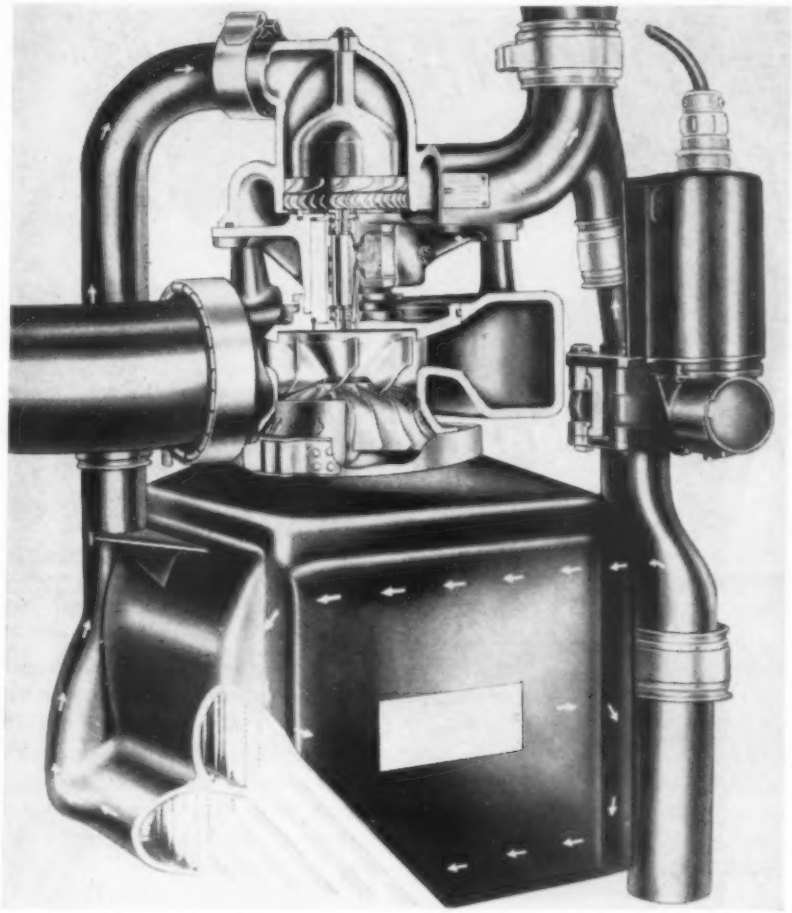
Weight: 11.1 lbs. complete

Size: Indicator, L-2-9/16", Dia. 1-15/16" Transmitter, L-10-29/64", H-3⅜" Power Supply, L-11-5/16", Dia. 4-1/16"

General: Currently being installed in Boeing B-47 jet bombers, the new G-E mass flowmeter gives the pilot a direct reading of fuel consumption in pounds per hour and is capable of operating up to 12,000 pounds per hour mass flow and 200 psi pressure. The system transmitter uses two cylinders placed end to end with equally spaced holes around the periphery of the upstream cylinder. This cylinder is rotated by a constant speed drive and fuel entering the holes changes its momentum. The resultant torque on the second cylinder is measured and translated into mass rate of flow. 97

Air Conditioning

For more information see pages 5 and 6.



• REFRIGERATION UNIT

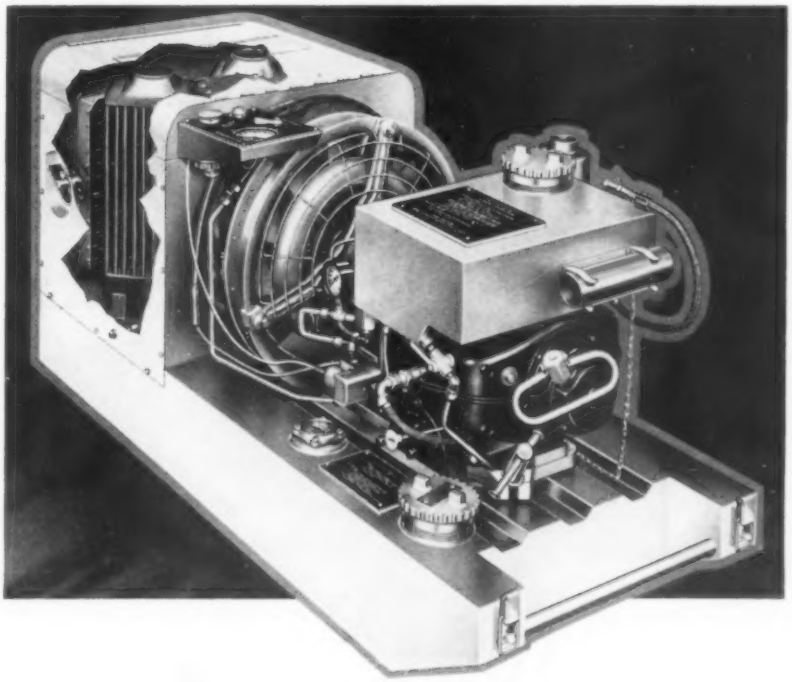
Model: R-20 and R-25 series
Mfr.: Hamilton Standard Div., United Aircraft Products
Weight: 16 to 43 lbs.
Size: Varies with installation
General: Meeting cooling requirements from 275 BTU per minute to 1510 BTU relative to 90° F. desired. Used on many current production military aircraft. Consists of air-to-air heat exchanger and a turbine fan assembly incorporating an air expansion turbine and a fan for obtaining positive cooling. Cartridge type lubricant simplifies lubrication. No servicing between overhauls. 98

• HELICOPTER HEATER

Model: S-25 and V-25
Mfr.: Surface Combustion Corp.
Weight: 12½ lbs.
Size: L-16½", Dia.-6"
General: A 25,000 BTU heater used for cockpit and cabin heat in production helicopters and as a gun heater on some fighters. Unit has flanges for easy installation. 99

Ground & Shop Equipment

. . . see pages 5 and 6.



• GROUND HEATER

Model: G-450
Mfr.: Surface Combustion Corp.
Weight: 227 lbs.
Size: L-50", W-20½", H-23½"
General: Portable combustion heater rated at 400,000 BTU per hour at -65° F. Discharge air temperature of 280° F. adjustable to less than 100,000 BTU at discharge temperature of 150° F. per hour at +60° F. ambient **100**

• GYRO TEST STAND

Model: A
Mfr.: General Mills Inc.
Weight: 66 lbs.
Size: L-16", W-15", H-12"
General: Operates on 115 volt, 60 cycle a-c source. Can test gyroscopic instruments at speeds from 36° to 1080° per minute. Fourteen slip rings for test outputs. Portable. **101**

• TERMINAL OMNI

Models: OR-101, OR-201, OR-301 and OR-401
Mfr.: Collins Radio Co.
Size: Housing 7' x 7' x 7' (approx.), antenna 9'
General: Collins' TVOR/LVOR/VOR units provide accurate visual navigation information to any aircraft equipped with VOR receiver. LVOR and VOR provide en route information; TVOR is used as an approach aid to the airport. Provides unattended operation with VOR and LVOR featuring standby transmitter with automatic transfer. Uses 115 volt, 60 cps, single phase power input. Output is 50 watts or 200 watts VHF RF, depending on requirements. **102**

• STEAM CLEANER

Model: 121
Mfr.: Aeroil Products Co.
Weight: 500 lbs.
Size: L-35", W-28", H-39"
General: The Model 121 steam cleaner converts 120 gallons of cold water per hour into saturated steam at 100 psi. Features downdraft boiler which will raise 100 psi steam pressure in 90 seconds. Operates 8 hours on one filling. **103**

• JET ENERGIZER

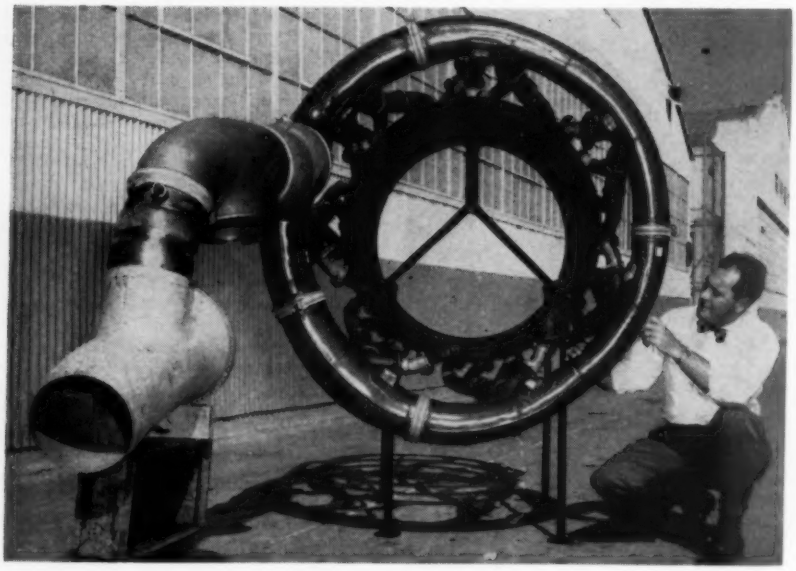
Model: 925
Mfr.: Motor Generator Corp.
Weight: 1300 lbs.
Size: L-45 5/16", W-31 13/16", H-55 13/16"
General: The Model 925 is rated for 500 amperes continuous draw, 700 amperes for three minutes, or 1000 amperes for one minute. Produces constant current from 500 to 1000 amperes over operating range from 10 to 28.5 volts. **104**

• INFRA-RED DRYER

Model: DRP
Mfr.: De Vilbiss Co.
Size: 48" square
General: Available in 48" square or 70" x 92" sizes, the De Vilbiss infra-red baking panels bake enamel in 30 minutes or dry lacquer and undercoats in 10 minutes or less. Available in ovens appreciably larger. **105**

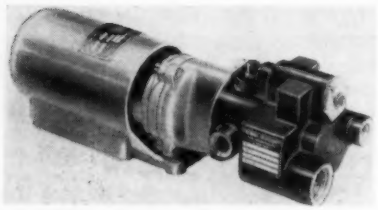
Miscellaneous Systems

. . . see pages 5 and 6.



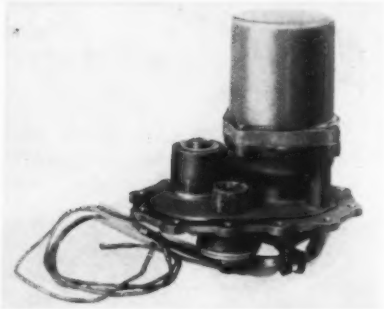
• EXHAUST SYSTEMS

Model: Rynalloy
Mfr.: Ryan Aeronautical Co.
sizes: 1½" to 5" dia.
General: For high temperature aircraft-exhaust systems, Rynalloy is a new heat and corrosion-resistant alloy designed for operating temperatures up to 1800° F. During development testing best alloy components were found to include a nickel content of 20% but not less than 13%, chromium not less than 1.8%, Silicon not exceeding 6%, and carbon limited to 2½%. **106**



• ALCOHOL PUMP

Model: RG-5490C
Mfr.: Lear Inc., Romec Div.
Weight: 4.3 lbs.
Size: L-10-9/64", W-3-11/16", H-3-15/32"
General: Used to supply alcohol to fuel filters in Boeing B-47 jet bombers, the Romec RG-5490C pump has a rated output of 60 gph at 35 psi discharge pressure and a maximum flow of 120 gph at 50 psi pressure. Pump operates from 27 volt d-c power source with 7 ampere draw. **107**

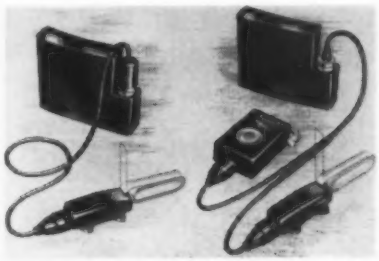


• WATER INJECTION PUMP

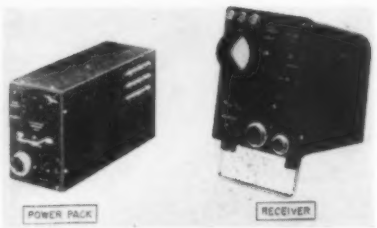
Model: RR-9700
Mfr.: Lear Inc., Romec Div.
Weight: 4.75 lbs.
Size: L-6¾", W-4⅞", H-7⅛"
General: A turbine type pump used to provide water for added engine take-off horsepower in the Douglas C-124, the model RR-9700 has an output of 110 gph at 35 psi discharge pressure. Operates from 200 volt, 3 phase, 400 cycle a-c current and features a balanced type relief valve adjustable in the range of 25 to 35 psi. **108**

• HEATER FUEL PUMP

Model: RG-9540A
Mfr.: Lear, Inc., Romec Div.
Weight: 3.55 lbs.
Size: L-7-29/64", W-2¾", H-4-7/32"
General: Provides source of fuel pressure for combustion heaters in Boeing B-50 and C-97 airplanes. Rated output is 35 gph at 25 psi discharge pressure. Operates from 27 volt d-c power source with 3.5 ampere draw. **109**



Units of signal device for use in locating lost personnel are shown above and below.



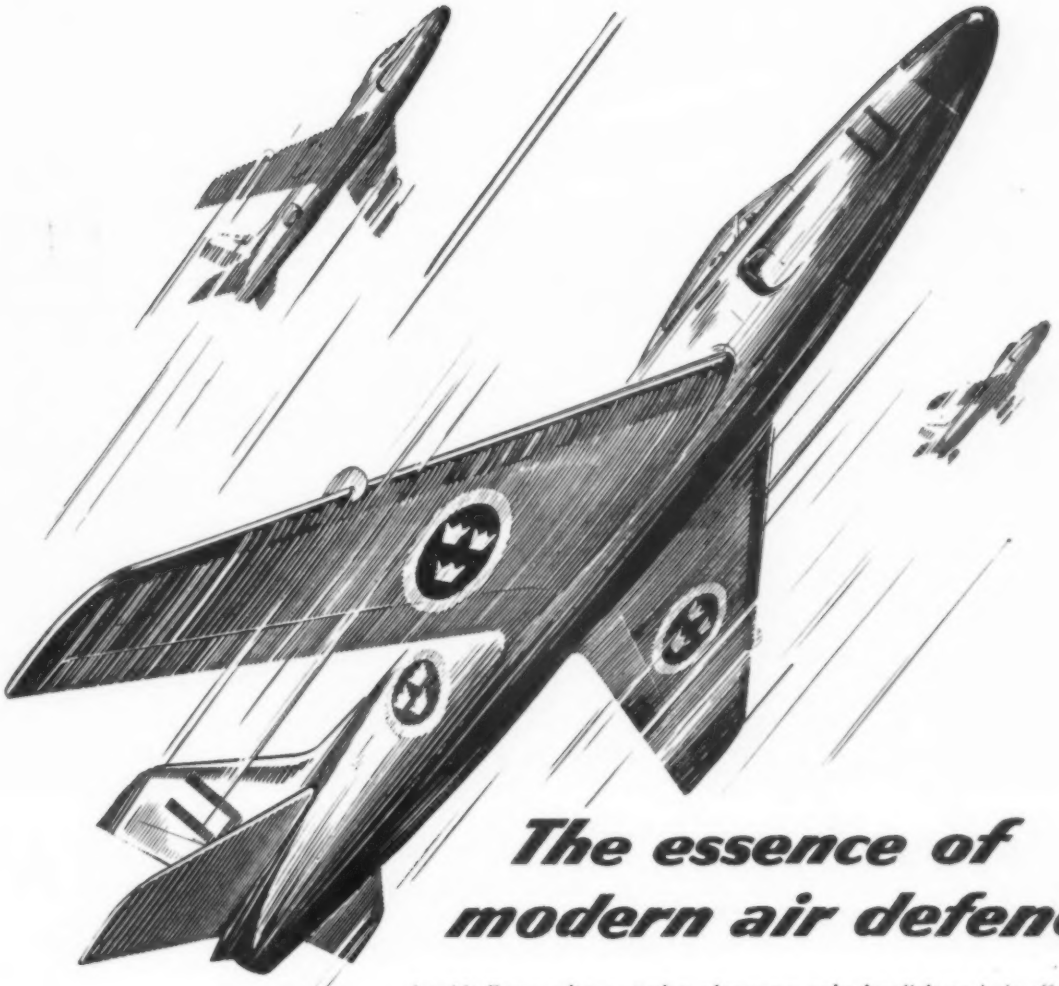
SARAH SEARCH UNITS

• AIR-SEA RESCUE

Model: SARAH
Mfr.: Simmonds Aerocessories, Inc.
Weight: 3¼ lbs. (Personal equipment)
General: For rescue of lost flight personnel, a miniaturized device providing positive and continuous directional information to search aircraft. Range is 66 miles and output 16 watts. Folding antenna with or without speech modulator. **110**

• SMALL-TUBE DEICERS

Model: 21
Mfr.: B. F. Goodrich Co.
General: New small-tube pneumatic Deicers for high speed aircraft. Designated type 21 for Lockheed Super Constellation installation, they are cemented to wing and tail leading edges instead of using metal-clip method as do older types. **111**

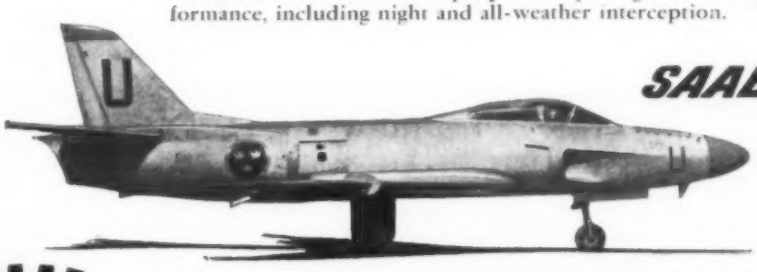


The essence of modern air defence

An Air Force whose combat planes are only day-fighters is, in effect, one armed. But strict economy, even in defence, is essential to all nations today, and so any country dependent for its safety on a powerful air defence force must choose not merely the most up-to-date and efficient aircraft, but also the most versatile and economical. Its fighter aircraft must be capable of more than one role.

The Royal Swedish Air Force has followed this principle in its procurement of combat aircraft. A striking example is the swept-wing Saab-29 jet fighter — now also available for export — which is being produced for three different military duties.

The next important step in the Swedish Air Force modernization programme is that centred around the 700 mph (over 1,100 km/h) Saab-32 Lansen all-weather jet, which has been chosen to become the standard all-weather attack aircraft. The Lansen is also most suitable for several other purposes requiring first class combat performance, including night and all-weather interception.



SAAB A 32 Lansen

SAAB

a versatile and ultra-modern all-weather jet aircraft

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Selection..."GRAND CENTRAL"

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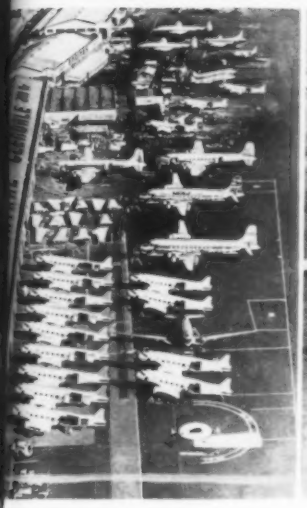

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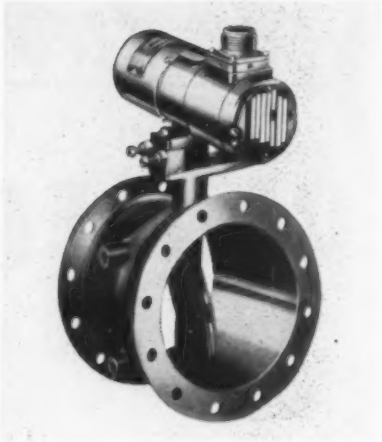


• BUTTERFLY AIR VALVES

Model: DYLZ

Mfg.: Barber-Colman Co.

Weight: 2½" actuator assy.—2.6 lbs.

Size: Standard sizes include 1½", 2", 2½", 3" and 4".

General: For low leakage, high temperature and high pressure usage. Max. recommended operating temperature is 700° F., max. operating pressure 150 lbs. psi. Actuator assemblies meet Mil-E-5272. **112**

• DESICCATOR

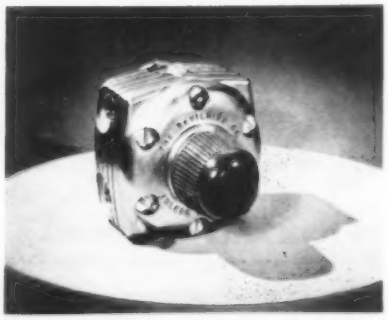
Model: USAF type B-1A

Mfr.: Lear-Romec Div.

Weight: 7⅘ lbs.

Size: L-10", W-6¾", H-3½"

General: Desiccator pumps and dehumidifies air in closed system to prevent frosting of dome lens of Type T-1 vertical bombsight, with 14 cu. ft./hr. free air under head of 4½" of water. Operates on 1/50 hp, 27 volt d-c with 15 amps. **113**



• AIR REGULATOR

Model: HAA

Mfr.: The DeVilbiss Co.

Size: W-3", H-4½"

General: Regulator has capacity of 80 cfm at 100 lbs. line pressure. Maximum pressure can be regulated 135 psi and has maximum line pressure 300 psi. Comes in two models. **114**

• MASS FLOWMETER

Mfg.: Hydro-Aire Inc.

Size: Length 6″, Width 2″, Height 4′.

General: Hydro-Aire's new mass flowmeter will measure rate of flow from 400 to 40,000 lbs./hr. with accuracy of plus or minus ½%. Operates on 24 volts d-c., 1 watt max. **115**

• AIRCRAFT HEATER

Model: S-900

Mfr.: Surface Combustion Corp.

Weight: 105 lbs.

Size: L-46″, Dia.-15″

General: A 900,000 BTU combustion heater with 400° F. outlet temperature, the S-900 is used in the late models of the Douglas C-124 and other military aircraft. **116**

Combustion Heaters. This is a series of Surface Combustion aircraft heaters ranging in capacity from 15,000 British Thermal Units to 900,000 BTU's. Numbered to coincide with the thousands of BTU's rated output, from left to right these are the S-900 (i.e., 900,000 BTU's), S-600, S-300, S-100, S-125, S-200, S-25, S-50, and V-15. **117**

• FANS

Model: Axivane

Mfr.: Joy Manufacturing Co.

Weight: 10 oz. to 52 lbs.

Size: 2″ to 14″

General: A series of fans with capacities to 5000 cubic feet per minute. Input requirements from 1/500 to 7½ hp and output to 70 in. water gage pressure. **118**

PHOTO CREDITS

19—Boeing, Chase; 20—Ryan; 21—AiResearch; 22—AiResearch; 30—Vickers; 35—G.E.; 40, 42, 44—U. S. Navy and NBS; 47—RCA, Westinghouse; 59—Stanford Research Institute; 66—Douglas, North American, Martin; 126—SNECMA.

Canadian Orders Discussed by Committee

The Joint Industrial Mobilization committee, including top defense officials of the U.S. and Canada, met recently to discuss past cancellations and possible future placement of defense orders in Canada for aircraft as well as electronics equipment for the radar network across the top of North America.

The Canadian four-man team headed by Defense Production Minister C. D. Howe met with Treasury Secretary George Humphrey, Commerce Secretary Sinclair Weeks, and top Defense officials reportedly to seek clarification of U.S. procurement plans, particularly the scheduled production of Beech T-34 trainers by Canadian Car & Foundry Co. Concern of Canadian officials is said to stem from anxiety in Canada over possible cancellation of $10 million T-34 contract following elimination of Canadair's $100 million Beech T-36 contract several months ago.

The visit of Canadian officials was also viewed as a possible outgrowth of unbalanced reciprocal purchasing between the U.S. and Canada.

Airline Commentary

By Eric Bramley

ANOTHER "first" for Logan International Airport at Boston. **"Sully" Guaragna,** barbershop concessionaire, now calls his shop "Logan Hairport." Can you top that one?

•

Have you seen the promotional material that Bonanza Airlines is sending to travel agents and other airlines? Certainly the sexiest in the industry. At the same time, it gets the point across and you can bet it's well read. John Schwarzkopf, Bonanza's sales and traffic director, cautions that the material is "strictly not for the general public." Put us on the mailing list, John.

•

Within a year or so it's probable that the major baseball leagues will be enlarged to include a couple of teams on the west coast—a very big thing, revenue-wise, for the airlines, because it seems certain that schedules and roadtrips will have to be based on air transport. We're told that baseball teams have been quietly polled and they're all agreeable to flying—which is quite a change, because only a couple of years ago most of them were cold to the idea. Baseball has been much slower to accept air transport than has college and professional football. Anyway, we know of at least one airline that's already eyeing this lucrative business.

•

This seems to be the season for funny definitions. We have two lists, one from International Air Transport Association, the other from CAA. The IATA list resulted from the recent meeting in The Hague of the airlines' fares and schedules officials. Having attended IATA meetings, we think these definitions rate a top prize:

Cabotage—None of your business.

Committee—A group that keeps minutes and wastes hours.

Conference—People who individually can do nothing, but who collectively agree that nothing can be done.

Expenses en route—The blonde in the next seat.

Free drinks with meals—Liquor served not more than three hours before or four hours after any meal.

No-show—A delegate needed by an 8 a. m. working group who is still at last night's conference meeting.

Regional fares—Play it my way or I'll take away my marbles.

Show of hands—To insure that no weapons are kept under the table.

State something for the record—Prepare an alibi for one's head office.

Warsaw Convention—Distinguishable from the Concerto by its dischord.

•

And, all in good fun, CAA's Office of Federal Airways comes up with the following (referred to in the code are CAA Administrator **Fred Lee** and Under Secretary of Commerce for Transportation **Robert B. Murray, Jr.**):

REBIM—Reference big mess.
TANFA—There are no funds available.
ITITO—I think I'll retire too.
COMEV—Combine everything in sight.
WHOSO—Who said so?
MUSSO—**Murray** said so.
LESSO—**Lee** said so.
MUZLE—**Murray** said to **Lee.**
LELIM—**Lee** listened to **Murray.**
WHAMMO—We haven't any more money.

People

MANUFACTURING

J. H. Overholser, formerly executive vice president of Hydro-Aire, Inc. has been named assistant manager of Bendix Aviation Corp.'s Pacific Division. Other recent changes at Bendix find: **J. D. Meyer** appointed sales manager of Landing Gear and Airframe Equipment; and **S. R. Craig**, appointed sales manager of Fuel Metering and Engine Equipment.

Sidney H. Webster has been named to succeed **George Craig** as manager of the Northeastern District for Jack & Heintz. Webster will make his headquarters in New York.

Jordan E. Johnson has been appointed to the post of Aircraft Application Sales Engineer for Vickers Inc.'s Mid-Atlantic Area.

Robert G. Gustavson has joined Pastushin Aviation Corp. as projects engineer in the engineering department. Gustavson was previously a supervisor in the structures section of North American Aviation's engineering department.

D. H. Silvern has been appointed senior engineer in charge of the Gas Turbine Analysis Group at Continental Aviation and Engineering Corp. Before joining Continental, Silvern was head of the analysis section, Gas Turbine Dept., for the Clark Brothers Co.

B. M. Brown of Westinghouse Electric Corp. has been appointed manager of the firm's Air Arm Division, succeeding **M. P. Hottel**, resigned. Prior to his move to the Air Arm Division, Brown was manager of defense products sales for Westinghouse.

Brown

Hardy

AIRLINES

Charles F. Sharp was recently elected vice president of sales for National Airlines, filling the vacancy created by the resignation of **Walter Sternberg**. Sharp, as assistant vice president, has been in charge of NAL's sales activities since last May.

Another recently announced change for National makes **Alexander G. Hardy** an assistant vice president. Hardy, who joined the line's executive staff in 1951, will be in charge of NAL's activities in Washington.

E. I. Whyatt, vice president and comptroller of Northwest Orient Airlines, has resigned, effective January 1, to become assistant to the president of Gould-National Batteries, Inc.

The following employes have recently completed 20 years or more of service in the aviation industry:

• **Al Opsahl**, Northwest Airlines. Senior supervising inspector, St. Paul. 25 years.

• **O. W. Brownlee**, United Air Lines. Station ground services manager, Toledo. 25 years.

• **G. G. Burnett**, United Air Lines. Assistant foreman, San Francisco maintenance base. 25 years.

• **C. C. Coppin, Jr.**, United Air Lines. Captain, Los Angeles. 25 years.

• **C. E. Johnson**, United Air Lines. Supervisor of mechanical service, Honolulu. 25 years.

• **W. E. Larned**, United Air Lines. Manager of flight operations, Los Angeles. 25 years.

• **Claude G. Adams**, Braniff Airways. Secretary-treasurer, Dallas. 20 years.

• **Helen E. McCall**, Trans World Airlines. Senior accountant, Kansas City. 20 years.

AA Quits Fight on Freight Rates

The CAB's proposed 25% increase in minimum air freight rates was all but assured this month when American Airlines, the lone objector, withdrew its opposition. Claiming the case was dominated by "economic problems" of Slick and Flying Tigers rather than by "sound rate-making principles," AA thus opened the door for early establishment of the new higher rates.

Slick and Flying Tigers asked the increase claiming, in effect, that necessary increases in their rates could not be made for competitive reasons stemming from AA's refusal to go along. A CAB increase in minimum rates would be compulsory on American.

Initially American entered objections to the Slick-FTL proposal. It also served "notice of objections" after the CAB show cause order proposing the increase. But in its latest move the carrier summed up the situation this way:

"In an unprecedented rate-making pronouncement, the Board asserted that the overriding, and indeed only immediate, considerations were that two experimental carriers, Slick and FTL, were conducting marginal operations and that Slick, in particular, had an urgent need for prompt rate relief.

"The statutory rate-making factors such as the effect of rates upon the movement of traffic, the public interest . . . and the efficiency of carrier operations, were given no consideration."

Texas Routes to Northeast Considered

New airline routes between the Texas-Oklahoma area and major northeast U.S. cities will be considered in what CAB calls the "Additional Southwest-Northeast Service Case," slated to get under way in the next few months.

In defining the scope of the case this month, CAB consolidated applications of eight scheduled airlines and two non-scheduled carriers for simultaneous consideration. The proceeding is the third and largest of CAB's three major route cases activated this year.

Scheduled lines which will be considered for new routes in the area are American, Braniff, Capital, Delta/C&S, Eastern, National, TWA, and United. Only American operates through service between points involved at present. Non-scheduled applicants are North American Airlines and Aero Finance Corporation.

Basically the case centers around a 1946 TWA application to include Tulsa and Oklahoma City on its transcontinental route. CAB has denied requests to bring in issues involving new routes west of the Texas-Oklahoma area. But it conceded that the public interest requires a look at proposals for new or improved service "between cities in the Texas-Oklahoma area and the northeastern cities."

Routes to be considered will be via Tulsa, Oklahoma City, Memphis, New Orleans, and Atlanta. CAB emphasized that "any new service authorized may be provided only on through flights" between the southwest and northeast.

CAB MISCELLANY

Delta-C&S Air Lines has asked CAB to include its Miami-Havana route application with others in the New York-Balboa Through Service Case, now under way.

•

Northeast Airlines has moved to dismiss a CAB enforcement complaint which charges certain violations of the Act and a CAB divestiture order. Enforcement case will thus be held up until 10 days after Board action on the motion.

•

Transport Airgroup, Inc., Toledo business group, has withdrawn as a potential transferee for controlling interest in Lake Central Airlines.

•

Pan American World Airways has been granted a six-month exemption to offer tourist service on the Seattle/Portland-Honolulu portion of through flights to and from Australia, New Zealand, Tokyo, and points beyond.

•

Riddle Airlines has filed application for authority to transport first-class mail by air.

CAB News

AS OF NOW . . .

The **North American Enforcement Case** is proceeding according to a "progressive stipulation" under which parties agreed to stipulate facts in the record, rather than participate in lengthy formal hearings. Examiner William F. Cusick anticipates "four to six weeks" will be consumed in the process. The case had been delayed all summer by a court fight in which North American unsuccessfully sought to block formal hearings.

February or March is looked upon as the "most probable time" for a final decision in the **Trans-Atlantic Cargo Case** in which five applicants seek all-cargo certificates for the Atlantic area.

More imminent is a decision in the **Slick-Flying Tiger Merger Case** which can be looked for before the end of the year.

Also slated for expedited handling is the **Japan Air Lines Foreign Permit Case** in which JAL seeks authority to fly the Pacific. Barring unforeseen developments, procedural steps will be over and a CAB decision signed by the President about the first of next year.

RECENT CAB DECISIONS

• **National and Braniff** turned down on motions which sought to by-pass an examiner's report in the Reopened New York-Balboa Through Service Case.

• **Pan American World Airways** again denied suspension of new Transocean Air Lines' tariff naming fares in U.S.-Hawaii market.

• **Aerovias Sud Americana** and North American Food Carriers acquisition agreement and exemption application dismissed upon request of applicants.

• **Alaska Airlines** turned down on motion to expand States-Alaska Case to include intra-Alaska routes of Pan American World Airways.

CAB CALENDAR

Oct. 26—Hearing in Bonanza Renewal Case. Washington, D. C. Docket 5774 et al.

Nov. 2—Hearing in New York-Chicago Service Case. Washington, D. C. Docket 986 et al.

Nov. 9—Hearing in Continental Renewal Case (Socorro, et al.). Washington, D. C. Docket 5869 et al.

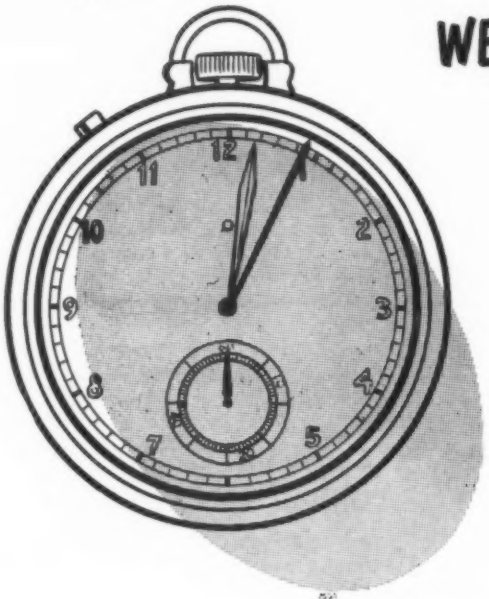
Nov. 16—Hearing in Braniff Route 106 Renewal Case. Washington, D. C. Docket 6050 et al.

Nov. 30—Hearing in Lake Central Acquisition Case. Washington, D. C. Docket 5570 et al.

Nov. 30—Hearing Airwork Limited Trans-Atlantic Cargo Permit Case. Washington, D. C. Docket 6188.

Dec. 1—Hearing in Niagara Falls Airport Case (American Airlines). Niagara Falls, N. Y. Docket 6125.

We are big enough to say, "NO!"



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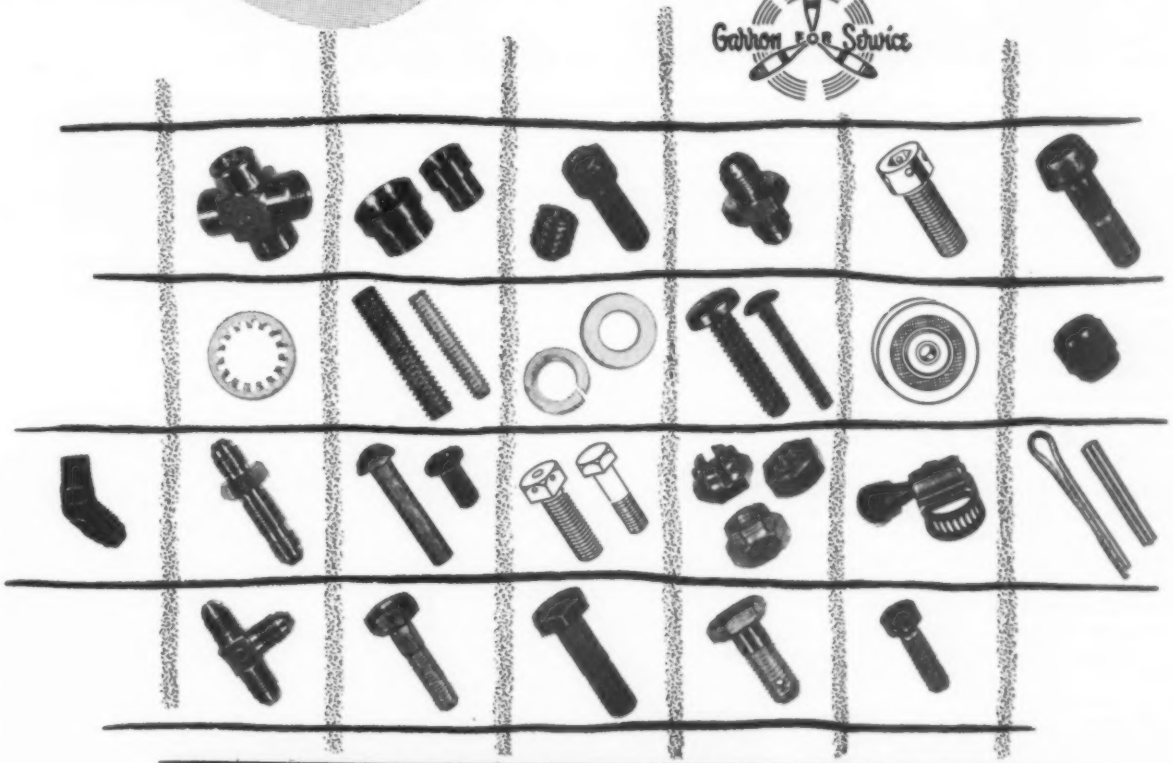

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INTERNATIONAL AVIATION

Edited by Anthony Vandyk

INTERCOM

Rarely has the Canadian air transport scene been more active than it is at present. The two major carriers, Canadian Pacific Airlines and Trans-Canada Air Lines, are still awaiting cabinet action on the former's application to operate an all-cargo service across Canada, and the issue is arousing considerable interest throughout Canada as a free-enterprise—government-monopoly test case. CPA has said it will sell its two DC-6A's if its application is not approved and TCA, to show that it is freight conscious, has brought three Bristol 170's.

The all-cargo case has limelighted TCA's monopoly on transcontinental air transport, as has a recent application by Canada's youngest carrier, Pacific Western Airlines, to operate a coach service across western Canada paralleling the TCA route.

As if to answer its critics TCA recently introduced the family fare plan and has announced that it will inaugurate coach operations within a few months, using its North Stars fitted initially with 57 and later with 70 seats.

Although CPA and TCA are at war in the all-cargo case, they are cooperating in operations to Latin America: CPA's schedules from Vancouver to Mexico City and Lima are being coordinated with those of TCA's new route from eastern Canada to the Mexican capital, making possible through Canadian service from Montreal and Toronto to Lima. CPA, incidentally, has decided to take up its option on three or four Comet II's and will base them in Vancouver since (unlike the IA) they will be able to fly the Vancouver-Honolulu sector of the Canada-Australia route.

Unlike CPA's DC-6B's, however, they will have to call at San Francisco and Canton to refuel.

There is good news too of TCA's turbine equipment program: the Viscount deliveries look as though they will be on time or even ahead of time. The Super Connies are also eagerly awaited and are expected to win TCA a lot of new Atlantic business. Latest TCA innovation on the trans-Atlantic route is the inauguration of one-plane service between Toronto and Europe; previously passengers had to change at Montreal.

HD 32 Transport Ordered by Air France

The first of the present crop of "DC-3 replacements" (AMERICAN AVIATION, August 31) to be ordered into production will be the Hurel Dubois HD 32. Max Hymans, board chairman of Air France, has announced that his company will order 15 to 20 of the twin-engine (P&W R-1830) high-wing transports subject to approval of the board of directors. The French national airline will use the HD 32's principally in overseas territories of the French Union such as West Africa, Central Africa and Madagascar on routes currently flown with DC-3's.

Meanwhile in preparation for production of the HD 32, the Hurel Dubois company has appointed M. Kommer as production planning engineer and M. Escande as commercial manager. Kommer is regarded as one of France's top aeronautical engineers and was formerly in charge of planning of aircraft procurement programs for the French Civil Aeronautics Administration. Escande has for the past several years been assistant to Max Hymans and thus is well informed on the airline market.

The prototype HD 31 is being returned to the flight test center at Marignane following slight modifications to improve its maneuverability at slow speeds. Meanwhile, the HD 32 prototype is nearing completion and should be ready to fly early in December. The latter will be used for intensive utilization tests, some of which will be conducted by Air France.

Caravelle Claims Design Advantages

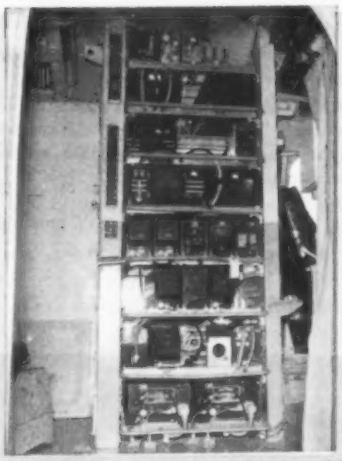
France's SE 210 Caravelle twin-jet transport, now under construction at SNCA du Sud-Est's Marignane plant, is due to fly in May, 1955.

Main characteristics for the SE 210 are: span, 112′ 6.4″; length, 103′ 4″; height, 29′ 4″; ground clearance, 6′ 11.8″; height from ground to axis of engines, 9′ 9.6″. Range varies from 750 to 1550 miles. Cruise begins at 31,000 feet and ends between 36,000 and 37,750 feet.

On a typical flight (1430 miles) with a payload of seven tons, cruising speed will be about 455 mph in standard conditions with reserves (with maximum payload of 9.5 tons range is reduced to 1,055 miles). Take-off run to clear a 50-foot obstacle, 5900 feet.

Hurel Dubois HD 31 is the forerunner of the HD 32 "DC-3 replacement" which is to be built in quantity by the French manufacturer.

What about this new DC-7?



Rack of Collins equipment in the new DC-7. Equipment that guides the big plane on cross country flying, leads it unerringly to precise instrument landings, provides dependable contact with ground stations at all times.

Sixty passengers can board the DC-7 and travel in air-conditioned comfort non-stop from coast to coast . . . in only 8 hours.

How fast is it? The fastest piston-powered airliner in the world. Cruising speed 365 mph. Top speed 400 mph. It takes you nonstop from New York to Los Angeles in just 8 hours. The power comes from four turbo-compound engines which generate a total of 13,000 horsepower.

What's it like inside? Luxurious and big. It seats 60 in air-conditioned comfort. With additional lounge space in the rear. The buffet can handle 72 complete meals and snack service. Cargo capacity: 13,980 lbs.

What kind of flight and radio equipment? Collins! Here's a typical installation of Collins equipment in the fabulous new DC-7: two 51V Glide Slope Receivers, two 51R-3 Navigation Receivers, one 351 VOR accessory unit and a 37J VOR antenna for dual ILS and Omni reception; the Collins 51R Receiver and 37R Antenna for VHF communications; the 18S Transceiver and 180 K Antenna Tuning Unit for HF communications; Omni Bearing Selectors for dual RMI instrumentation . . . all Collins.

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INTERNATIONAL AVIATION

MANUFACTURING

BRITAIN: First flight of the Short Sherpa powered glider (AMERICAN AVIATION, September 28) took place on October 6.

FRANCE: First flight of the second SO 4050 Vautour prototype—a single-seater—is expected to take place in a few weeks. The first prototype has been undergoing extensive tests at Bretigny and flew at supersonic speeds 20 times during 40 flights.

The Bearn company is developing a new version of its Minicab personal plane. The new model, known as the Super Cab, will have a longer fin, a retractable landing gear and 90-hp Continental engine. Initially six will be built.

Price of the SO 1220 Djinn light helicopter (AMERICAN AVIATION, September 28) is $17,150 with delivery in a year's time. The model is driven by compressed air fed to blade tips from a Turbomeca Palouste.

NETHERLANDS: Fokker made a profit of $45,000 in 1952. Prince Bernhard and General Aler, formerly chief of staff of the Dutch Air Force, are joining the Fokker board.

SWITZERLAND: First flight of the Pilatus P.3 two-place trainer took place last month. Powered by a 260-hp Lycoming, the plane has empty weight of 2270 pounds, a gross of 3307 pounds, and a top speed of 217 mph.

JAPAN: Production of the Beech T-34 trainer by Fuji Heavy Industries is likely. The Japanese government is expected to order 70 to 80 of the planes.

ARGENTINA: The state-owned IAME plant at Cordoba is to build the Pulqui II jet fighter designed by Kurt Tank, formerly of Germany's Focke-Wulf company.

MILITARY

NETHERLANDS: Lieutenant General A. Baretta has succeeded Lieutenant General I. A. Aler as chief of staff of the Netherlands Air Force.

JAPAN: A five-year program for the National Security Forces calls for a build-up to 1400 planes, including 800 combat aircraft. Implementation is dependent on U.S. aid.

FRANCE: Two Max Holste MH 1521 Broussard light transports have been ordered by the French Air Force. These planes will be taken from a pre-production line of 20 to be built by the company as a private venture.

The Fouga 170R has won the French government's jet trainer competition and the Air Ministry has ordered about 100 of the twin-engine tandem-place planes. Morane-Saulnier's MS 755 Fleuret lost out mainly because its side-by-side configuration is now in disfavor with most French instructors.

AIRLINES

FRANCE: Air France will open its "Golden Parisian" trans-Atlantic service ($125 surcharge) in November. Super Constellations on this service will feature "Skyrooms" with completely private accommodations.

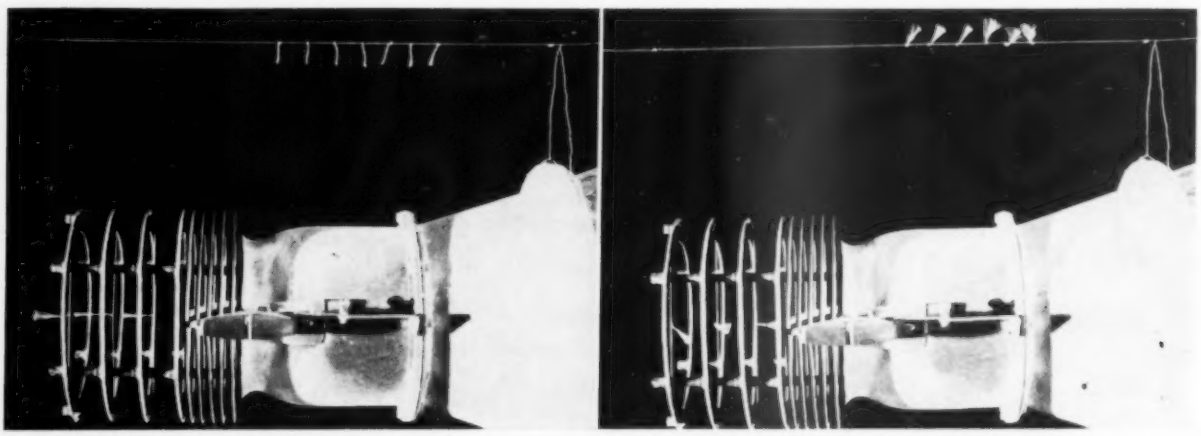
UAT was scheduled to open its Paris-Johannesburg Comet service on October 26. The independent airline's jetliners have now carried almost 30,000 passengers.

VENEZUELA: Linea Aeropostal Venezolana is about to open a service to Madrid and Rome with Constellations. Next year Super Connies will go on the Europe route. LAV's two Comet II's, due for delivery in mid-1955, will be used exclusively on routes to New York (via Havana), Santiago de Chile, and Buenos Aires.

BELGIUM: SABENA Belgian Airlines has inaugurated the first direct service between New York and Manchester, with a weekly tourist flight. Later the Brussels-Manchester-New York service may be boosted to twice weekly.

SWITZERLAND: Swissair will open a weekly DC-6B service to South America next spring. The route will be flown in pool (both costs and revenue shared with SAS).

JAPAN: Japan Air Lines has now received its first DC-6B and is using it on the Tokyo-Sapporo domestic route.



SNECMA's reverse-thrust device above (left, with normal thrust; right, with reverse thrust) has been used successfully in flight tests for well over a year on a French-built Vampire powered by a Goblin. The French device has also been fitted to other engines, including the 220-pound thrust Turbomeca Pimene and the 6200-pound Atar 101C. The hoop-shaped deflectors are fitted to the engine's tailpipe outlet and are specially designed for use with afterburner-equipped engines, where the biggest problem is the prevention of damage to components from the very high temperatures produced.

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Technical Literature

COMPONENTS: Langley Corp. of 660 Second Ave., San Diego 1, Calif. has produced a new eight-page brochure, outlining its facilities for production of precision aircraft hydraulic and mechanical controls.

AIR TOOLS: Catalog No. JE-1660 details features of Thor No. 2 series of air-operated drills, grinders, screwdrivers, and nut setters as manufactured by Thor Power Tool Co., 175 N. State St., Aurora, Ill.

DECIMAL CHART: Reiff & Nestor, Lykens, Penna., is making available a decimal equivalent, tap drill and screw thread chart to supervisors, foremen, machinists, tool engineers and draftsmen. The opposite side contains National Course and National Fine threads, pipe threads, and ASME standard and special threads.

APPRENTICESHIP REPORT: "A Half-Century of Experience in Training Machinists" is an analysis of the operation of the apprenticeship system of the Kearney and Trecker Corp. of West Allis, Wisc. Write Publications Branch, Bureau of Apprenticeship, U.S. Department of Labor, Washington 25, D. C.

BALL BEARINGS: A 20-page catalog, published by Miniature Precision Bearings, Inc., Keene, N. H., presents latest design and application data on miniature ball bearings. Included are radial, angular contact, pivot, and thrust bearings.

HAND PYROMETER: Type FH-1 hand pyrometer is described in GEA-6020, four-page booklet prepared by the General Electric Co., Schenectady, N. Y., to show uses and applications for the portable instrument which measures temperature of any surface, liquid, gas or molten metal from 0° to 1500° F.

MOTOR GENERATOR: Circular E11 describes new motor generator which converts 60 cycles to 400 cycles, as designed by Georator Corp., Manassas, Va.

WET BLASTING: Information on deburring, die and mold polishing, blending grind lines, scale removal, honing of cutting tools, and preplating cleaning equipment with both regular velocity and high velocity pressure blast wet blasting equipment is contained in an eight-page booklet issued by The Cro-Plate Co., Inc., 747 Windsor St., Hartford 5, Conn.

SIGNAL GENERATORS: How Simpson signal generators can be adapted for UHF applications is the subject of a booklet titled "How to Use the Simpson 479-480 for UHF Alignment," prepared by Simpson Electric Co., 5200 W. Kinzie St., Chicago 44, Ill.

RELAYS: Relay catalog describes the Joseph Pollak Corp. of 81 Freeport St., Boston 22, Mass., line of series 100 d-c computer, series 300 d-c miniature, series 400 a-c/d-c coaxial, and series 500 d-c communication relays.

RIVETING: The fourth edition of "Riveting with Hi-Shears" for the aircraft industry is now available from The Hi-Shear Rivet Tool Co., 8924 Bellanca Ave., Los Angeles 45,, Calif.

PROCESS CONTROL: New 42-page data book and catalog includes information on thermocouples, radiation detectors, and resistance bulbs for process control problems. Available from the Wheelco Instrument Div., Barber-Colman Co., Rockford, Ill.

CENTRIFUGAL PUMPS: Bulletin No. 237-C describes Thrustfre 2-, 3- and 4-stage pumps for heads up to 650 psi and with capacities of from 50 to 850 gpm. Pennsylvania Pump & Compressor Co., Easton, Penna.

ELECTRONIC COMPUTING DEVICES: New catalog, issued by George A. Philbrick Researches, Inc., 230 congress St., Boston 10, Mass, covers the latest developments, new components, and prices of GAP-R electronic analog computing devices.

FOAMED PLASTIC: Reinforcement of aviation equipment parts is one of the applications suggested in 28-page booklet titled "Nopco Lockfoam—New Foamed Plastic," published by Nopco Chemical Co., Harrison, N. J.

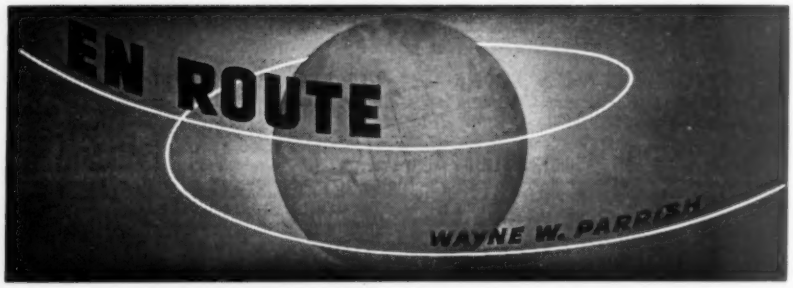
COIL HOLDERS: A four-page folder by Acme Steel Co., 2840 Archer Ave., Chicago 8, Ill., outlines the coil holders available for the company's line of wire stitching machines.

ELECTRICAL TESTING INSTRUMENTS: General Electric Co., Schenectady, N. Y. has a 16-page buyer's guide to its electrical testing instruments.

HOLE PUNCHING: Wales Catalog H illustrates and describes the new independent self-contained type "H" horizontal hole punching units designed by Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N. Y.

BOOKS AND EQUIPMENT: Aero Publishers, Inc. of 2162 Sunset Blvd., Los Angeles 26, Calif., has produced its 1953 catalog of aviation books and equipment, containing over 600 listings from all sources, including the Government Printing Office.

TESTING UNITS: Four-page bulletin describes line of research and testing units produced by the Bowser Technical Refrigeration, Terryville, Conn.



Castellana Hilton. It is doubtful that in all the annals of hotel openings there has ever been anything approximating the gala opening of the new Castellana Hilton in Madrid last July.

It was chaos, but a sort of grand, de luxe Spanish style of chaos. My being there was purely a quirk. TWA's Madrid manager, **Frank Howell,** found out I was in Tangier and sent me a telegram urging me to come over, but what he didn't know was that I had to fly from Tangier to Paris and Stockholm to keep a business date first.

To make the opening a big splash in Madrid as well as capture some trans-Atlantic publicity in the U. S., the Hilton Hotel chain had flown two TWA chartered Constellations filled with Hollywood and New York movie, TV, and stage stars to Spain for the occasion. As far as talent goes, **Hilton** had it lined up 10 deep.

If It Works. But the best of plans can go amiss in Spain. In the first place the hotel was supposed to have been finished long ago. It was built with Spanish financing and leased to Hilton. But the Hilton people wanted to inject strictly U. S. efficient ideas into the hotel in order to make it the plushiest and finest hostelry in all of Europe. So they had a lot to do with the designing.

If by some chance everything electrical and mechanical in the hotel should ever operate all at the same time, and for any length of time, Castellana Hilton might well lay claim to being Europe's finest. It's de luxe in a modern style.

But American designs and American specifications are fine in America. Spanish construction and Spanish workmanship are something else again.

During almost the entire period of the gala opening the two main elevators were not operating. You had to either walk up as many as six flights or take your choice squeezing into a service elevator at the far end of one wing.

Lights—Sometimes. Electricity in Madrid is notoriously capricious. My friend **Frederik Ludvigsen** of SAS lives on the seventh floor of an apartment house and he has to walk up two days each week because Madrid is forever short of electric power. Not only is it cut off on certain days but it's likely to go off at any time.

So in the midst of a very fine formal cocktail party given by **Warren Lee Pierson,** chairman of the board of TWA, the lights went out and everybody scurried around lighting candles. Not long after the candles were all lit and the scene seemed like something out of the 18th Century with all of the formal evening gowns and such, the lights came on. So the candles were blown out. Then the lights went out again and everybody scurried to re-light the candles.

Most of the hotel is supposed to be air conditioned but the equipment was only partly functioning—it was made in Spain—and it was a lot better to keep the windows open. Of course the hotel has probably installed its own electric power plant by this time but, like most everything else, it wasn't ready for the opening.

Bidet, Of Course. The Hilton rooms are large and well furnished and well lighted. Modern touch throughout. The bathrooms are especially good by European standards and each is equipped, as one might expect, with a bidet. But the Hilton people or whoever designed the hotel added a useful touch by putting both the bidet and the toilet in a separate compartment of the bathroom. There are even American-type showers in the tubs and as tourists well know, showers are either non-existent or very awkward in Europe.

Nothing happened to the porcelain that I know of, but I heard that about 40 plastic toilet seats broke into pieces, and it was reliably reported to me that the august chairman of a certain airline was one of those who suffered the frustration and humiliation of busting through his toilet seat in its inaugural use.

One of the best stories involves toilet paper and was told to me by one of the top Hilton executives in the U. S. who went over to the opening and had to meet many of the crises. There is nothing in this world more impervious to moisture than Spanish toilet paper, so the Hilton people, faced with the job of providing the best of everything for the Hollywood bigshots, decided they had to have better quality paper for the guests. So they sent a Spanish employe by railroad to the British colony of Gibraltar in southwestern Spain to buy a carton or two of the somewhat better English product.

Into Jail. The employe got to Gibraltar okey, bought a couple of cartons, and started back to Madrid. At the border he was accused of attempting to smuggle the toilet paper into Spain and both he and his cargo were thrown promptly into the brig. It is an actual fact that the Hilton people had to go to the director of tourism of Spain and entreat him to use his good offices to get their employe and their toilet paper out of jail and up to Madrid in time for the opening. Just what happened to the English stuff I don't know because I sure didn't rate it.

The designers specified a great deal of big plate glass in the main lobby, modern style, and intended to import it from the U. S. But the Spanish government refused to permit the importation of glass (or much of anything else for that matter) and so these huge pieces of glass were made in Spain. I hear that it is cracking and breaking with considerable regularity, and the replacements are costing a lot of dough.

The Spanish do some things well. Such as textiles. The uniforms for the hotel help are all made in Spain and the Hilton people told me they couldn't begin to match the quality in the U. S. The same goes for carpeting. But much of Spain still operates on a hand-work basis and the hotel must be cleaned from top to bottom by hand. It is illegal to own and operate a vacuum cleaner of any kind in Spain and Hilton couldn't obtain an exemption. Work is so short in Spain that no matter how menial the job may be the government wants that job available for a person and doesn't want it taken over by a mechanical contrivance.

Who's Changing Who? For instance, the Hilton people noticed that all of the room service carts had been delivered without wheels, thus necessitating two men to take a meal to a room. After much argument they finally got the Spanish to put wheels on the carts so that only one waiter would be needed. That's what they thought. They got the wheels, but two men continue to carry the cart to the rooms.

It seems to be a first class tussle whether Hilton is injecting new ideas into Spain or whether Spain is teaching Hilton that time changes slowly. The fact remains that the hotel has many fine features and is worth a visit even if you never stay there. It may well turn out to be Europe's No. 1 hotel. The lounge, the tiled patio, water fountain, bar, and shop area are all magnificent. The opening was pretty rough going, however, and it will probably be a year before there is a semblance of order. Building and opening a hotel in Spain should be at least a 10-year project. Here's luck to you, Hilton folk. Just keep an ample supply of candles handy. And don't put me on that fifth floor again.

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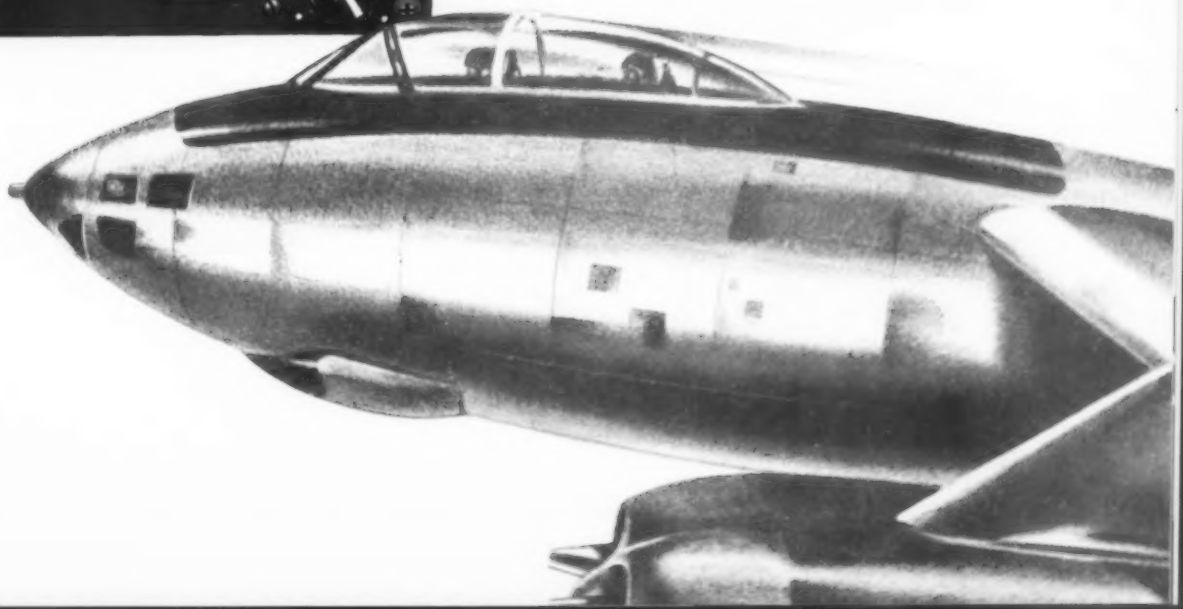

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News at Deadline

Wilson Lifts Limit on Research Funds

Defense Secretary Charles E. Wilson has rescinded his order of last summer that the military limit its research and development spending to 75% of the money appropriated by Congress for that purpose.

Pentagon sources said that the entire $1.3 billion has been restored because several important research programs would have otherwise been eliminated. About 8,000 projects will be financed with the funds, Wilson stated, adding that basic research will be supported at a rate of "between $25 million and $30 million" both this year and next.

Doman, Gen'l Dynamics Near Closing Stock Deal

Doman Helicopters, Inc. is expected to conclude the sale of a substantial block of stock to either General Dynamics Corp. or Canadair, Ltd. within the next 30 days, it has been learned. Details are now being negotiated. Where the controlling interest will wind up is not yet known.

Last July, at the time of the licensing agreement with Hiller Helicopters for military production of the Doman YH-31, Glidden S. Doman, president and chairman of the board, stated that his company would concentrate on development of civilian markets. A month later, an announcement appeared in a financial paper to the effect that Doman was offering 60,000 shares of $1 par common stock at $3.00 per share.

Unspent AF, Navy Funds Reported on by Byrd

The Joint Committee on Reduction of Nonessential Federal Expenditures has reported that the USAF had $19,273,997,000 and the Navy $7,267,525,000 in unexpended balances for purchase of aircraft and related procurement as of last June 30.

Chairmanned by Sen. Harry Byrd (D., Va.), the committee report also shows that the Air Force began fiscal 1953 with $13,027,383,000 carry over for plane purchases, received $12,685,044,000 in new money for a total of $25,712,427,000 and spent $6,438,288,000.

Navy Bureau of Aeronautics, the report continues, began fiscal 1953 with $5,523,544,000 in carryover money for aircraft construction and had new authorizations for $3,910,042,000 for a $9,433,586 total. BuAer expenditures for new planes totaled $2,166,060,000.

Talbott Sees Danger in More Cutbacks

Further cutbacks in U.S. airpower would "invite disaster." The warning was issued by Harold E. Talbott, Air Force Secretary, in a recent speech delivered to the Automobile Old Timers in New York. He observed that recent AF savings from a reduction in aircraft and engine procurement "are available to expedite the development and delivery of new and better aircraft." Proper air strength, he feels, "can be provided within our national income."

Aircraft Industry Now At Peak, Lewis Says

The aircraft industry, now employing over 500,000 people and delivering $1 billion worth of planes and equipment a month, is at its peak and the trend from here on will be downward "as we shift to a production phase in which modernization of the Air Force is our primary problem rather than its initial buildup of strength," according to Assistant AF Secretary Roger Lewis.

In a speech before the National Defense Transportation Association in Louisville, Lewis called U.S. transports the "best in the world." These planes, he said, are developed primarily for commercial use, with the military contributing in development of components, such as engines, propellers and accessories, and in sponsorship of basic research and development of fighters, the knowledge from which manufacturers can apply to commercial transports.

"Military and commercial airlpanes and engines are similar. Each contribute to the progress of the other, but they are not identical, and in my opinion it would be a great mistake and, insofar as transport and cargo types of airplanes are concerned, an impediment to progress rather than an incentive to it, if we were to force the development of single types for both military and commercial purposes."

CAB Supports Study

CAB Chairman Oswald Ryan has pledged CAB's full cooperation to Under Secretary of Commerce Robert B. Murray for his study of civil aviation.

AMC/ARDC Advisory Group Formed by Cook

An advisory group has been formed to assist Lt. Gen. Orval R. Cook, Air Force Deputy Chief of Staff/Materiel in improving cooperation and collaboration between the Air Materiel Command and the Air Research and Development Command. Cook was recently charged with final responsibility for the two Commands.

Members include: Brig. Gen. Floyd Wood, ARDC Deputy Chief of Staff/Development; Col. William E. Sault of AMC's Procurement and Production; Edward C. Wells, vice president in charge of engineering, Boeing Airplane Co.; Dr. Mervin Kelly, president of Bell Telephone Laboratories; and Dr. Edmund P. Learned, professor of business administration, Harvard Business School.

Gen. Nathan F. Twining, AF Chief of Staff, stated that Lt. Gen. Laurence C. Craigie, Deputy Chief of Staff/Development, will report to Cook "in order to achieve a beter integration and coordination of materiel matters." Twining advised contractors to deal with the same offices as in the past.

Supreme Court Upholds Slick Injunction Suit

Slick Airways has been granted the right to pursue its $30,000,000 anti-trust injunction suit against American, United, and Trans World airlines in the courts, by order of the Supreme Court. This sustained a lower court ruling of June 18, 1951 that Slick was "properly in court," and was a refusal to shift the complaint to CAB. The case will be heard by U.S. District Judge Philip Forman of Trenton, N. J., but will not go to trial for some months, according to Steptoe & Johnson, Washington law firm.

Over three and a half years ago Slick charged the three carriers, as well as Air Transport Association and Air Cargo, Inc., with conspiracy to monopolize air transportation in violation of anti-trust laws. ATA and ACI positions are still unresolved.

Lufthansa Orders 340's

Confirmation has been received that Germany's Lufthansa has purchased four Convair 340's for early 1954 delivery. Consolidated Vultee also has granted an option for purchase of seven more.

Long-Range Bombers Favored by Gen. White

Gen. Thomas D. White, AF Vice Chief of Staff, warns that it would be "suicidal" to put major emphasis on air defense as a means of stopping atomic and hydrogen bomb attacks on the U.S. Apparently worried by what he termed the "recent centering of public interest on air defense at home," White stated that this country's "safest and surest defense" is a fleet of intercontinental bombers capable of instant retaliation. He felt that there could be "over-emphasis" on continental defenses.

Speaking before a recent meeting of the National Security Industrial Association in Washington, White revealed that the USSR's long-range bomber fleet is comparable in size to the USAF's Strategic Air Command. He also said that Red bombers compare qualitatively with most of the SAC aircraft.

Jordan Joins Hughes

William C. Jordan, one-time president of Curtiss-Wright Corp. and, more recently, executive vice president of Hiller Helicopters, has been named vice president and general manager of Hughes Aircraft Corp. He replaces Gen. Harold George, who resigned after a dispute with Howard Hughes.

Douglas Expected to Get New R4D Conversions

Douglas Aircraft Co. is expected to be awarded a contract for modernization of Douglas R4D's in the near future, but for a lesser amount than anticipated. It has been learned that officials in the Overhaul and Maintenance Section, Navy Bureau of Aeronautics, are studying the economical aspects of converting the R4D to the R4D-8 (Super DC-3).

During House Appropriations subcommittee testimony early this summer it had been found that BuAer planned a $28 million modernization program and Douglas has already accomplished about 100 R4D conversions to the -8 specifications.

NWA Files Pacific Tourist Fares

Northwest Airlines has filed a tariff with CAB for establishment of tourist service in the Pacific area effective November 8. The carrier will carry combined first class and tourist passengers aboard Stratocruisers. One way fare will be $500 from Seattle/Tacoma, Los Angeles, or San Francisco, to Manila, Okinawa, and Taipeh with round-trip at $900. From West Coast to Tokyo one way fares are to be $450 and round trips $810.

Resort Buys Three DC-4's from NAL

Resort Airlines expects to take delivery on three 58-seat Douglas DC-4's in November. Purchase was made from National Airlines at a cost of "over $2 million," including spares. Resort will use the aircraft in military charter work until mid-December. Thereafter, two aircraft will be used in cruise service with the third DC-4 being held in reserve for availability as an extra section during peak winter months for Caribbean air cruises.

Contract negotiations are underway whereby NAL will take care of maintenance and overhaul of Resort DC-4's at its bases in Miami and New York International Airport.

Convair 340 Turboprop

First of the two Model 340's that Convair's Ft. Worth plant is converting to turboprop power for the Air Force has been stripped of engine nacelles and most of the empennage and installation of the two Allison 3750-hp YT56 engines will begin soon. Aeroproducts propellers will be used.

AAAE Asks Intervention

American Association of Airport Executives has asked CAB for permission to intervene in the Frontier Airlines Winslow, Ariz., controversy. It is the first time AAAE has made such a move. Francis Bolton, president, said the organization is concerned because of the precedent that may be set. If CAB grants Frontier's petition to bypass Winslow, it will be technically ruling on the right of airports to negotiate directly with airlines on fees to be charged, he said. This is strictly a matter between airport authorities and carriers, and is an individual community problem, he added.

NAL Charges Illegal Control by EAL

National Airlines has asked CAB to reopen the record in the Colonial Merger Case claiming new evidence supports charges that (1) Eastern seeks control of all air transportation in the New England-New York area and (2) Colonial can become self-sufficient on its own.

A CAB decision reportedly favoring an Eastern-Colonial merger currently is at the White House awaiting Presidential action.

Adding to its previous charges that Eastern "illegally controls" Colonial, National said a "syndicate" made up of three Eastern directors sought control of Northeast Airlines, Wiggins Airways, and New York Airways.

AF Seeks Way to Speed 'Fixes' on Aircraft

The Air Force is looking for a better way of reporting unsatisfactory operation and malfunction of aircraft and equipment. The volume of unsatisfactory reports has been increasing due to newer, more complex planes, AF officials said.

Current system of processing reports has become cumbersome, resulting in delays in performing "fixes" on equipment. AF is considering greater use of modern business machines and methods to speed analysis of information submitted from the operational level.

TTA Asks $1 Million Mail Pay Increase

A temporary annual mail pay increase of about $1 million has been requested by Trans-Texas Airways. In addition, the carrier has asked CAB for $127,988 for the period July 1 through October 31, 1953, claiming that CAB, in fixing present rates, "over-estimated non-mail revenues and under-estimated operating expenses." If the request is granted, TTA's annual mail pay for next year will go to $3,456,894 from its present $2,480,306.

TTA wants the increase to meet break-even need and it would contain no element of return on investment.

AF Depots Peril Service Industry, Wolfe Says

Air Force's depot system should be on a stand-by basis and geared for expansion when needed, with a bigger share of work distributed to private industry. Thomas Wolfe, president of Pacific Airmotive Corp. and current head of the Aircraft Service Association, states. He pointed out that the present depot system has 300,000 civilian employes and costs about $1 billion yearly.

Despite the fact that thousands of U.S. jet planes have been produced, "no jet engine overhauls are being performed by service companies," he told the Los Angeles Chamber of Commerce aviation committee. "The work is all retained by the depots."

The service industry, he added, has to "operate a year at a time, not knowing what the next year may bring. Better planning is needed to save the . . . industry, just as it had to be brought about to save the aircraft manufacturing industry." He also hinted that more of the aviation industry may move into the south because of more favorable labor wage rates.

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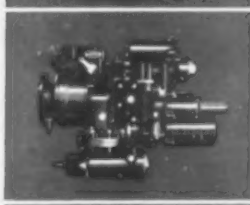
electronic

ELECTRONIC CONTROL Senses engine speeds, gas temperatures and other control factors—then signals fuel requirements to the fuel metering unit.



FUEL METERING UNIT Electrically controlled, this unit meters fuel to the engine in accord with signals from the electronic control.

ELECTRONIC AMPLIFIER Maintains a scheduled exhaust turbine temperature by controlling the nozzle area.

hydro-mechanical

MAIN FUEL CONTROL The control illustrated includes a governor which holds the engine at a selected speed regardless of altitude.

AFTERBURNER FUEL CONTROL Graduates the afterburner thrust by selecting fuel flow in various proportions to mass air flow through the engine.

NOZZLE CONTROL A hydro-mechanical servo control unit which actuates the variable exhaust nozzle mechanism of a jet engine.

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— says J. Hampton Manning,
Manager, Bush Field Airport
Augusta, Georgia

J. HAMPTON MANNING (right) discussing reports with Guy Williamson, Superintendent of Aircraft Operations. As Airport Manager for Bush Field, Mr. Manning knows from experience what little service "extras" mean to his customers. In less than five years, Mr. Manning has built his airport into one of the country's finest, solely on the basis of quality and service.

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